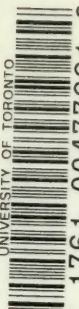


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A HISTORY
OF
BRITISH QUADRUPEDS.

502

A HISTORY
OF
BRITISH QUADRUPEDS,
INCLUDING THE CETACEA.

BY
THOMAS BELL, F.R.S. F.L.S. F.Z.S. F.G.S.

MEMBER OF THE
PHILOMATHIC AND NATURAL HISTORY SOCIETIES OF PARIS;
OF THE IMPERIAL ACADEMY CÆSAR: LEOPOLD: NATURE CURIOSORUM;
OF THE HUNGARIAN ACADEMY OF SCIENCES;
OF THE ACADEMY OF SCIENCES OF PHILADELPHIA;
OF THE NATURAL HISTORY SOCIETIES OF NEW YORK AND BOSTON;
HONORARY MEMBER OF THE ROYAL ZOOLOGICAL SOCIETY OF IRELAND, ETC., ETC.;
LATE PRESIDENT OF THE LINNÆAN SOCIETY.

Second Edition,
REVISED AND PARTLY RE-WRITTEN BY
THE AUTHOR,

ASSISTED BY
ROBERT F. TOMES,
CORRESPONDING MEMBER ZOOLOGICAL SOCIETY,

AND
EDWARD RICHARD ALSTON, F.Z.S.

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TO
GEORGE BENTHAM, ESQ., F.R.S.,
THE PRESIDENT,

AND TO THE MEMBERS OF
THE LINNEAN SOCIETY

THIS WORK IS RESPECTFULLY AND GRATEFULLY DEDICATED

BY THEIR FORMER PRESIDENT
AS A HUMBLE RECORD OF HIS DEEP SENSE OF THE HONOUR
AND HAPPINESS WHICH HE HAS DERIVED
FROM HIS CONNECTION WITH THE SOCIETY
FOR NEARLY SIXTY YEARS.

P R E F A C E

THE advantages of local Faunas are too generally understood and acknowledged to require any lengthened proof or illustration. It may indeed be doubted whether the study of the animals of particular tracts of country has not contributed more than any other means to the advancement of zoological knowledge, especially as regards those important branches, the geographical distribution of animals, the influence of climate, of soil, and of other local circumstances, in determining the range of species, the changes of varieties, and the extent and periods of migration.

It is true that in few instances only will the animal productions of a single country furnish such a multitude of forms in any particular group as may afford a satisfactory illustration of the whole plan of zoological arrangement. But even under our own ungenial and changeful skies, few persons are aware to what extent such domestic means of study exist, or how little we need be indebted to foreign aid in acquiring the first principles at least of zoological science.

But allowing the necessity of foreign importations for the acquisition of a knowledge even of certain principal groups in each class of animals, there is another impor-

tant advantage in the cultivation of the Natural History of our own country which requires no limitation—an advantage which appeals with greater force in the present era of the general diffusion of knowledge than at any former period: and that is, the means which are thus offered to multitudes of persons who are restricted by circumstances from engaging in the study of the higher departments of the science, of obtaining a rational and never-ceasing enjoyment; and, to the young especially, of opening an exhaustless source of amusement, at once healthful to the body and favourable to the development of the best qualities of the heart and understanding.

It was with these views that the series of works on British Zoology, of which this volume forms a part, was first undertaken, and it was confidently hoped that the united labours of several British Naturalists—each illustrating the departments to which his attention had been most particularly directed—would produce a Fauna of this country far more complete than could have emanated from the unaided talent and exertions of an individual; and the reception which these works have met with seems to show that these hopes were not altogether groundless.

Since the year 1839, when the first edition of this work was published, so much has been added to our knowledge of our native animals, that it has been found necessary to revise the entire volume, and completely to re-write a considerable portion of it.

It has been thought best to omit entirely the chapters on the domestic animals which were given in the first edition; first, because these species cannot be properly regarded as members of our Fauna, and secondly because it is impossible to give any satisfactory account of their history and varieties within such narrow limits.

Omitting these domestic animals, *sixty-seven* species of British Mammals were treated of in the first edition. Of these *seven* have now been rejected: namely, *Vespertilio emarginatus* and *Phoca barbata* as having been wrongly identified, and *Vesp. pygmaeus*, *Plecotus brevimanus*, *Sorex remifer*, *Lepus hibernicus*, and *Physeter tursio* as not being certainly distinct species.

On the other hand, *thirteen* species have been added to the list, of which one only is a land animal (*Sorex pygmaeus*)*, two are Seals (*Phoca hispida* and *Cystophora cristata*), and the remaining ten are all Cetaceans. These last are:—*Balæna biscayensis*, *Megaptera longimana*, *Balenoptera sibbaldii*, *B. laticeps*, *B. rostrata*, *Hyperoodon latifrons*, *Ziphius cavirostris*, *Grampus griseus*, *Delphinus acutus*, and *D. albirostris*.

The whole catalogue of British Quadrupeds, as accepted in the present edition, includes *seventy-three* species, belonging to the following orders:—

Cheiroptera	.	.	14	species
Insectivora	.	.	5	„
Carnivora	.	.	15	„
Rodentia	.	.	13	„
Ruminantia	.	.	4	„
Cetacea	.	.	22	„

The claims of *three* of these species to a place in our Fauna must, however, be regarded as somewhat doubtful; these are *Vespertilio murinus*, *Phoca grænlantica*, and *Balæna mysticetus*. The reasons for and against their admission are treated of under their separate heads.

* *Sorex pygmaeus* was at first accidentally omitted, and the error was not detected until the portion of the work treating of the Insectivora had been printed off. A figure and description have been given on a single leaf, with the pagination “148a,” so that it may be bound in at its proper place.

The publication of the present edition of this work has been so long delayed, that the Author feels it to be his duty to explain, as briefly as possible, the cause of the non-fulfilment of its promised appearance, and to remove the responsibility of the failure both from his respected publisher and himself. His removal from his residence in London—the centre of literary and scientific society and information—together with other personal circumstances over which he had no control, induced him gladly to avail himself of the well known extensive knowledge of Mr. Tomes as regards both the history and habits of the animals to which his attention had been specially directed, and his acquaintance with the foreign literature of the subject; and much of the additional interest of the earlier portion of the volume, including the orders Cheiroptera and Insectivora, is due to him, and is gratefully felt and acknowledged. It is painful to be obliged to add that the extremely dilatory manner in which this advantage was bestowed, caused extreme uneasiness both to Mr. Van Voorst and to the Author, and occasioned the lamented delay.

The postponement, however, vexatious as it was, had the favourable result of enabling the Author to obtain the co-operation of his friend, Mr. Alston, to whom he is indebted for most of the improvements in the whole of that part of the work which was left untouched by Mr. Tomes. For the complete and effective manner in which Mr. Alston has fulfilled his task, for the constant courtesy and kindness which have characterized his relations with the Author, he has his most sincere and grateful thanks;—and the scientific readers of the work will be able to judge to what extent it is indebted for its present improved state to Mr. Alston's labours.

The Author has also the pleasant duty of offering his

own and Mr. Alston's warm thanks to many gentlemen who have contributed their aid to the present revision of the work ; amongst whom they would particularize the following :—Professor Flower, of the Royal College of Surgeons, Prof. Turner, of Edinburgh, Prof. Rolleston, of Oxford, Dr. J. E. Gray, of the British Museum, Dr. Murie, late Prosector to the Zoological Society, Prof. Newton, and Mr. J. W. Clark, of Cambridge, Mr. A. G. More, Mr. H. Evans, Mr. Ogilby, and Mr. Southwell, of Norwich.

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BRITISH QUADRUPEDS.

CHEIROPTERA—BATS.

Family, VESPERTILIONIDÆ.*—Genus, *Vespertilio*.

Generic Character.—Cutting teeth $\frac{4}{6}$; grinders variable; † nostrils without foliaceous appendages; ears at most very little longer, sometimes shorter, than the head, not united at the base.

THE genus *Vespertilio*, restricted as it now is by the necessary dismemberment of the large group which was formerly comprehended under this term, still retains a considerable number of species, of which no less than ten are natives of this country, besides one species of *Plecotus*, one of *Barbastellus*, and two of *Rhinolophus*, making in all fourteen species of the order.

The investigations of Kuhl, a young and enterprising German naturalist, whose premature death disappointed the high expectations which his almost precocious acquirements and his excellent general views in zoological science had deservedly raised, had thrown much light upon the Bats of his own country; ‡ and, as

* Insectivorous Bats, without nasal appendages.

† It is the *false grinders* only that vary in their number in the different species; the true grinders being always $\frac{3}{3}$.

‡ “Die Deutschen Fledermäuse, von Heinr. Kuhl.” Neue Wetter. Anal. I. Bd.

may have been expected from the similarity of climate and of temperature, as well as from the propinquity of the two countries, several which he had first discovered in Germany, as well as others previously described, have since been found in different parts of Great Britain.

So many good observers have of late years paid attention to the more obscure species of European mammalia without increasing the number of species, that the opinion expressed in the first edition of this work, that many other species of Bats would be found indigenous to our islands, cannot now be entertained. In the present edition, instead of adding to the British list, we have to exclude three species, viz., the *Vespertilio pygmaeus* of Dr. Leach, the *Vesp. emarginatus* of Geoffroy, and the *Plecotus brevimanus* of Jenyns. The former of these is obviously the young of the Pipistrelle; the second, although a well-marked species, and occurring in France and Belgium, has never, so far as is at present known, appeared in the British Islands; and the third is now, by common consent, regarded as the young of *Plecotus auritus*.

The species indigenous to this country, and indeed all the European ones, belong to the true insectivorous division of the order. The general habits of these are therefore similar, and may with advantage be detailed in this place.

The whole structure of these singular animals is evidently and admirably calculated for the exercise of considerable powers of flight. In this point of view, they form not only a very distinct and circumscribed group within themselves, but, in fact, there exists no other type amongst the different classes of vertebrated animals, excepting of course the whole class of birds, on which any separate group is modelled, having similar powers,

or offering any distinct analogical relation to them. The expansion of skin extended between the anterior and posterior extremities of the Colugo, *Galeopithecus*, a genus formerly referred to the present order, but which properly belongs to the Quadrumana,—of the Flying Squirrel, *Pteromys*, amongst the Rodentia, and the Flying Opossum, *Petaurista*, amongst the marsupial animals; the increased development of the fins in the Flying Fish, *Exocetus*, and the cutaneous web supported by the elongated ribs in the Flying Lizard, *Draco*,—are all of them examples of an expansion of the integument upon certain bones, for the purpose of enabling these animals to take long and somewhat sustained leaps; but to the performance of this one action each of these structures is strictly limited. There is no instance of a quadruped, a fish, or a reptile, sustaining itself in the air by a succession of impulses given by any such organs as those now alluded to. But in the Bats, the whole structure is obviously modified to the fulfilment of this object. The sternum, the ribs, and the bones composing the shoulder, are all developed for the attachment of powerful muscles, adapted to the rapid and continued movements of the anterior extremity, which, although consisting essentially of the same parts as that of man, has its different bones so modified in form and extent, as to afford the most admirable and complete support to an extensive expansion of the skin, which thus forms a perfect and efficient pair of wings. This modification principally consists in the extraordinary development of the fingers, which are greatly elongated for the purpose; and upon which the skin is stretched like the silk on the rods of an umbrella. The skin which forms the flying membrane is exceedingly thin, generally devoid of hair on both sides, and is furnished with very slender transverse bands in

every part; it extends not only between the elongated fingers, but from the last finger to the posterior extremity, and in the greater number of the known species, from this to the tail. That portion which is situated between the hinder legs, and in which the tail is included, is termed the interfemoral membrane, and is generally, but not always, present in the insectivorous species, some of the *Phyllostomidæ*, or Leaf-nosed Bats of the New World, forming an exception to this rule.

Of the fingers of the anterior extremity, the thumb is the only one which is left free; it is of moderate length, and furnished with a hooked nail. The hinder toes are short, of nearly equal length, and are chiefly used as suspending organs, the Bats hanging by them, from the trees or walls on which they rest, with the head downwards.*

The flying membrane is not the only part which indicates a tendency to an extraordinary development of the cutaneous system. The ears and the nose exhibit in many cases a curious conformation, consisting of the great expansion of the former, and some remarkable appendages to the latter. The ears are, in all the British Bats, of considerable extent; and the tragus is of large size in those in which the nasal appendages just alluded to do not exist: in the Long-eared Bat, the ear is nearly as large as the body, and the tragus very long; but in the *Rhinolophus*, or Horse-shoe Bat, though the ears are large, the tragus is not perceptible; and there are certain very curious foliaceous appendages to the nose, which will be described hereafter.

Admirably as this extension of the anterior extre-

* The figure at page 11 is a representation of the Long-eared Bat, *Plecotus auritus*, in this position; the long ears being folded under the arms, and almost wholly concealed by them, whilst the tragus is exposed and pendulous.

mities and development of the cutaneous system is adapted to the purposes of flight, we shall find that, of the different parts of which it is composed, the osseous basis for the support of the membrane, and the membrane itself, are both applicable to other purposes than those to which they may appear to be primarily destined. The flying membrane is frequently used as a cloak or mantle, in which not only these little creatures enshroud themselves, but in which the females hold and shelter their young; the posterior portion of it, or interfemoral membrane, is also stretched forwards and expanded, by means of the tail and thighs, during parturition, forming a safe and easy cradle into which the young ones are received at the moment of their birth.

But there is another, and still more important and interesting office, which the membrane of the wings appears to perform, and which deserves especial notice. Spallanzani had found that Bats, when deprived of sight, and, as far as possible, of hearing and smelling also, still flew about with equal certainty and safety, avoiding every obstacle, passing through passages only just large enough to admit them, and flying about places previously unknown, with the most unerring accuracy, and without ever coming into collision with the objects by which they passed. He also stretched threads in various directions across the apartment with the same result. So astonished was he at these curious facts, that he was led to attribute the phenomenon to the possession of a sixth sense, unknown to us. Cuvier was the first to appreciate the real value of these experiments, as affording a proof of the existence of a vast expansion of the most exquisite sense of touch over the whole surface of the flying membrane; the naked surface and delicate structure of which appear well calculated to form the seat of so im-

portant a function. From this view, therefore, it would appear, that "it is by means of the pulsations of the wings on the air that the propinquity of solid bodies is perceived, by the manner in which the air reacts upon their surface." The transverse bands before mentioned as traversing the whole of the flying membrane, are formed of small thickened points, which have very much the appearance of minute glands, particularly on the inter-femoral portion. Have they any connection with the extraordinary sensibility of the membrane just alluded to?

Similar experiments to these of Spallanzani were made by M. de Jurine, and the details given in the "*Journal de Physique*" for 1798. The results differed somewhat from those arrived at by Spallanzani; although, when the eyes were destroyed, the Bats continued to pass and repass through narrow openings with ease, yet M. de Jurine invariably found that, when, in addition to the destruction of the eyes, the auditory openings were effectually closed, the creatures struck their wings against any object which came in their way.

Although the extremities are adapted, in their most extended action, only for the purposes of flight, yet they are capable of affording the means of walking on the ground, and still more, of climbing with great ease up perpendicular places, if there be sufficient inequalities on the surface to allow of a firm hold by the little hooked nail of the thumb. In walking, the wings are closed, the long fingers being folded against the arm, and the animal rests upon the wrist. The foot of one side is then extended forward, and the thumb-nail is hooked into the ground; the body is next raised by means of the hinder foot, which has been placed partly under the body, and thus thrown forward; the other side is next

propelled in the same manner: it is therefore by a succession of these plunges that their progression on the ground is effected, which is sometimes sufficiently rapid to deserve the name of running. This action, it must be acknowledged, is but a ludicrous attempt compared with the progression of other quadrupeds; but it is sufficient for their wants. Indeed, the habit of judging of the comparative value and importance of a structure by viewing it only in those forms in which it is most extensively developed, is liable to give very erroneous notions of the general adaptation of structure to its function, the contemplation of which constitutes the great charm and interest of all natural science; and it cannot be too strongly urged, that the apparently imperfect and abortive means of terrestrial progression given to the Bat and the Sloth are as indicative of infinite wisdom as the power of the Lion or the fleetness of the Antelope, because it is equally fitted to their requirements.

The Bats are all of them nocturnal or crepuscular in their habits. Sleeping during the day in the most retired places, some of them in the darkest retreats of forests, in the hollows of trees, suspended from the bark, or concealed amongst the leaves; others in the most inaccessible parts of ruined edifices, in the roofs of churches, or similar unfrequented places; they come abroad as soon as the twilight begins to steal over the face of nature, and to offer them the safeguard of obscurity. Then in the pursuit of those insects which, like themselves, avoid the glare of daylight, they exhibit the most rapid and various movements, sometimes flying with great swiftness over the surface of the water, then rising to considerable height in the air, and turning suddenly to one side or the other,

as their prey performs its various gyrations to escape from them. These easy and graceful evolutions present an interesting scene, in perfect harmony with the quiet of a calm summer evening, and possessed of sufficient animation to relieve the sameness and gloom of the hour, without interrupting its stillness and tranquillity.

Do our Bats ever migrate? or do Swallows ever hibernate? To these questions, unhesitatingly answered in the negative in the first edition of this work, we probably have still to make the same reply. But by extending the inquiry to the European species, we shall probably have to give a qualified affirmative to the first of them. It has been ascertained by Professor Blasius that these creatures not merely seek for a change of locality, but that they do so with such regularity that it becomes, in his opinion, a migration. His remarks apply exclusively to a northern species, the *Vespertilio borealis* of Nilsson, the most southern haunts of which are the mountains of the upper Hartz, and, according to Wagner, those in the vicinity of Regensburg. It passes, it would appear, northward in the month of August. As it is one of those species, according to Professor Blasius, which come abroad only in the advanced twilight, the most northern part of its range would be unsuitable to its habits "during the hot summer months, when, from the position of the sun, there is no intense twilight, or the sun does not set at all." "It is only," he further remarks, "when, at the advanced time of the year, the dark nights and intense twilight appear, that they arrive with their young in the northern latitudes. Since we know of no instance of specimens in the northern countries having been found in their winter sleep, and the rough weather appearing in the beginning of October, we cannot

suppose that they remain for more than six weeks until they return to their southern winter quarters."

Professor Blasius leaves us in doubt respecting the hibernation of this species after it has returned to its winter quarters, but the following remarks, in addition to those we have already quoted, are too interesting to be omitted:—

"If we determine," he continues, "their usual habitation, where they bring up their young, to be between 54° and 58° N. lat., and the supposed northern limit of their distribution to be about 68° to 70° N. lat., the result is a change of habitation of at least 10 degrees of latitude.

"This change of locality is the only ascertained fact in the mode of life of these Bats, and it may be compared with the migration of birds. Although we may be able to trace in the Hartz and other German mountains a wandering of allied species from the plain to the mountains, yet such a change extends only a few miles, and is measured by days and not by months. A striking difference between the migration of Birds and Bats is, that while the former move northward for the purpose of breeding, the latter arrive there only after they have grown-up young ones."

In this country, where, so far as we know, no change of habitat takes place, constant observation has shown that some species come abroad early in the evening, and others late, a given degree of light being necessary for each. May we not suppose that the migration of Bats observed by Professor Blasius was the mere unconscious appearance, night after night, of these creatures at a spot somewhat removed from that of the previous night, thus following the twilight, rather than what may be properly termed as migration? But the hiber-

nation of these animals is one of the most interesting points in their economy. At an earlier or later period of autumn, according to the species, they retreat, generally in large congregations of various species together, to the most retired places; as under the roofs of houses and churches, in caverns, in the hollows of trees, and similar situations, where they suspend themselves by their hinder claws, with the head downwards. Here they crowd together, holding not only by the surface of the walls of their retreat, but by each other, one crowding over another so closely that it appears scarcely possible for such numbers to occupy so small a space. The retirement of the different species takes place at very different periods of the year. The Noctule is seldom seen abroad much later than July; and the Pipistrelle, the most common of our indigenous Bats, will sometimes make its appearance, in fine mild weather, in almost every month in the year; it does not even restrict itself to the obscurity of evening, but may now and then be seen flitting about in the bright sunshine of a December day, in search of the few insects which the unwonted influence of his rays has called into a short-lived activity.

The female Bat brings forth one or two young at a birth, which she nurses with great tenderness and care, carrying it about with her, and holding it enshrouded in her ample cloak, which preserves it from all intrusion. During the period of breeding, some species are observed to pair; and Geoffroy St. Hilaire states, that whilst the female is suckling, the male places himself in front of the mother, so that the young one may be equally protected and warmed by both the parents at the same time.

It is perhaps difficult to account for the prejudices which have always existed against these harmless and

interesting little animals, which have not only furnished objects of superstitious dread to the ignorant, but have proved to the poet and the painter a fertile source of images of gloom and terror. That the ancient Greek and Roman poets, furnished with exaggerated accounts of the animals infesting the remote regions with which their commerce or their conquests had made them acquainted, should have caught eagerly at those marvellous stories and descriptions, and rendered them subservient to their fabulous but highly imaginative mythology, is not wonderful; and it is more than probable that some of the Indian species of Bats, with their predatory habits, their multitudinous numbers, their obscure and mysterious retreats, and the strange combination of the character of beast and bird which they were believed to possess, gave to Virgil the idea, which he has so poetically worked out, of the Harpies which fell upon the hastily-spread tables of his hero and his companions, and polluted, whilst they devoured, the feast from which they had driven the affrighted guests. But that the little harmless Bats of our own climate, whose habits are at once so innocent and so amusing, and whose time of appearance and activity is that when everything around would lead the mind to tranquillity and peace, should be forced into scenes of mystery and horror, as an almost essential feature in the picture, is an anomaly which cannot be so easily explained.

The views entertained, even by the most celebrated naturalists of antiquity, respecting the nature of these animals, were extremely vague. Aristotle himself, whose genius seems to have discovered, by an almost intuitive perception, the relations of natural objects, and the comparative value of external forms and structural characters, speaks of them as having feet as birds, but wanting

them as quadrupeds; of their possessing neither the tail of quadrupeds nor of birds;—of their being, in short, birds with wings of skin. He is followed, but with increasing error, by Ælian and by Pliny; the latter of whom says, that the Bat is the only bird which brings forth young ones and suckles them.* Even up to a late period they were considered as forming a link between quadrupeds and birds. It were a vain and useless task to recount every slight modification of this pervading error. The time has long gone by when Nature was accused of the most extravagant vagaries by the professed investigators of her laws, and when the absurd expression of “*lusus naturæ*,” or other equivalent follies, was forced into their service to account for all the wonders which their own limited views and scanty information failed to explain.

The common language of our own ancestors, however, indicates a much nearer approach to the truth in the notions entertained by the people, than can be found in the lucubrations of the learned. The words *Reremouse* and *Flittermouse*, the old English names for the Bat, the former derived from the Anglo-Saxon “*ræran*,” to raise or rear up, and “*Mus*,”—the latter from the Belgic, signifying “flying or flittering Mouse,” or from the Anglo-Saxon “flight,”—show that in their minds these animals were always associated with the idea of quadrupeds. The first of these terms is still used in English heraldry; though, I believe, it has ceased to belong to the language of the country. The word *Flittermouse*, corrupted sometimes into *Flintymouse*, is the common term for the Bat in some parts of the country. This expressive example of the correct observation of our Anglo-Saxon ancestors

* Voluerum animal parit vespertilio tantum: * * * * eadem sola volucrum lacte nutrit, ubera admovens; geminos volitat amplexa infantes, secumque deportat. Plin. Hist. Nat. lib. x. c. lxi.

is commonly used at Selborne, and other parts of Hampshire, as well as in that part of the county of Kent, in which the language, as well as the aspect and the names of the inhabitants, retains more of the Saxon character than will be found perhaps in almost any other part of England.

In the first edition of this work, the characters afforded by the shape of the ear and tragus, and the dentition, were first made use of in the following manner to divide into groups the simple-nosed species. We now reprint the passage verbatim:—

“The characters which are most easily detected and least variable, and which are therefore the most available in the discrimination of the species of this genus, are the forms of the ear and tragus, and the relative proportions of the ear to the tragus and to the head. In reforming, in some measure, the specific characters, I have endeavoured to define these proportions more distinctly than has hitherto been done. It is remarkable that the formula of dentition and the form and structure of the tragus combine to point out two distinct groups of the genus. In the one, the tragus is more or less rounded at the tip, short, and a little thickened in its substance: the dentition is as follows:—

$$* \text{ I. } \frac{1}{6} : \text{ C. } \frac{2}{2} : \text{ F. M. } \frac{4}{4} : \text{ M. } \frac{6}{6} = \frac{18}{18}.$$

In the other form, the tragus is relatively longer, thin, narrow, and more or less pointed: the dentition—

$$\text{ I. } \frac{4}{6} : \text{ C. } \frac{2}{2} : \text{ F. M. } \frac{6}{6} : \text{ M. } \frac{6}{6} = \frac{18}{18}.$$

“To the first group belong *V. noctula*, *Leisleri*, *discolor*? *pipistrellus*, *pygmaeus*? To the second, *murinus*, *Bechsteinii*, *Nattereri*, *emarginatus*, *Daubentonii*, *mystacinus*.

* I. incisors. C. canines. F. M. false molars. M. molars.

“*Serotinus*, which has a short, semicordate tragus, has the following dentition, which differs from both the other groups :

$$I. \frac{4}{6} : C. \frac{2}{2} : F. M. \frac{2}{4} : M. \frac{6}{6} = \frac{14}{18}.$$

“It will be seen that it is only the false molars which differ, the other teeth being similar in number in all the species of this genus.”

Overlooking the sections above indicated, Count Keyserling and Professor Blasius, in a paper on the European Bats, published in “Weigman’s Archives” for 1839, divided the simple-nosed species into precisely the same groups, and gave the generic name *Vesperugo* to the one having the rounded ears and broad tragus, *Vesperus* being at the same time proposed as a sub-generic appellation for the group represented by the Serotine Bat. These names have been continued by the above-mentioned authors in all their subsequent writings on the *Cheiroptera*, and by Professor Blasius in the first volume of his work on the vertebrate animals of Germany, which appeared in 1857.

But it is now obvious that it was to one of these groups that Dr. Leach long ago applied the name of *Scotophilus*, the type specimen, still preserved in the national collection, proving, on examination, to be a young example of either the Serotine Bat or of some allied form. The name of *Scotophilus* should therefore be substituted for *Vesperugo*.

In addition to the characteristics of these groups of simple-nosed Bats, as above defined, we now present our readers with the following, attention to which will materially assist in the discrimination of the more easily confounded British species :—

Genus, *Vespertilio*. Top of the head somewhat elevated,

muzzle rather pointed; ears more or less ovate, longer than broad, tragus long, narrow, tapering, with the tip bent a little *outwards*.

A. Wing membranes extending along the foot to the base of the toes.

Ex. *Vespertilio Nattereri* and *V. mystacinus*. *V. murinus* also appertains to this group, but is a less typical species.

B. Wing membranes extending only to the distal extremity of the tibia, leaving the foot free.

Ex. *Vespertilio Daubentonii*.

We have been unable to examine as fully as we could wish one of our British species, the *Vespertilio Bechsteinii*, but are much disposed to suspect that it will be found to be more closely related to a small group of ex-European species than any of the above.

Genus, *Scotophilus*. Top of the head broad and flat, muzzle broad; ears short and rather broad, rounded or approaching to a triangularly ovate form, tragus broad, rounded at the end, and curved *inwards*.

A. Ears roundish, tragus much broader at the end than at the base; head very broad and flat; wing membranes extending only to the distal extremity of the tibia.

Ex. *Scotophilus noctula*. *S. Leisleri* and *S. discoor* are less typical species of this circumscribed group than *S. noctula*, but they nevertheless appertain to it.

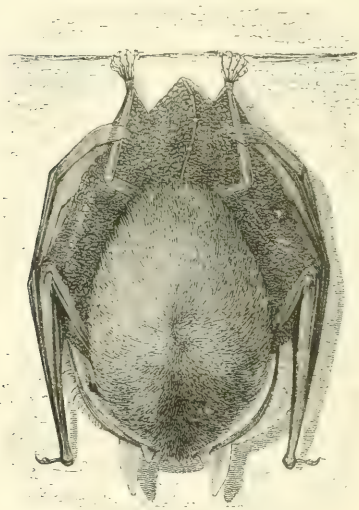
B. Ears triangularly ovoid, tragus of nearly uniform breadth, round at the end, and evenly curved towards the head; wing membranes extending to the base of the toes.

Ex. *Scotophilus pipistrellus*. To this group belongs the *Vespertilio Kuhlî* of Natterer, described in Kuhl's Memoir on the Bats of Germany, and the more

recently described *Vesperugo Nattereri* of Keyserling and Blasius.

C. Top of the head flat, but less broad than that of *S. Noctula*, muzzle a little more compressed; ears more distinctly ovate, tragus broadest at one-third from its base, from which it curves to a rounded point, having a strongly marked inward direction; wing membranes extending to the root of the toes; tip of the tail free from the membrane.

Ex. *Scotophilus serotinus*.



CHEIROPTERA.

VESPERTILIONIDÆ.



THE GREAT BAT.

NOCTULE.

Scotophilus noctula.

Specific Character.—Ears oval-triangular, shorter than the head; tragus not one-third the length of the ear, arcuate, terminating in a broad, rounded head; muzzle short, broad, and blunt. Wing membranes extending only to the distal extremity of the tibia.

<i>Vespertilio noctula,</i>	SCHREB. Saugth. p. 166, t. iii. DESMAR. Mammal. p. 156. FLEM. Brit. An. p. 6. JENYNS, Brit. Vert. p. 23.
„ <i>alticolans,</i>	WHITE, Nat. Hist. Selb. XXXVII.
„ <i>proterus,</i>	KUHL, Deutsch. Flederm. p. 41.
<i>Scotophilus noctula,</i>	GRAY, Mag. Zool. & Bot., 1838, p. 497.
<i>Vespertilio maculans,</i>	PETERS, Reise nach Mosambique, I. 61, xvi.
<i>Vesperugo noctula,</i>	BLAS. Faun. Wirb. Deutsch. p. 53, f. 33, 34.
<i>La Noctule,</i>	DAUBENTON, Mém. Acad. 1759, p. 380, t. ii. f. 1. BUFFON, Hist. Nat. VIII. p. 128, t. xviii. f. 1.
<i>La Serotine,</i>	GEOFF. Ann. Mus. VIII. p. 194, sp. 4.
<i>Great Bat,</i>	PENNANT, Brit. Zool. I. p. 146, t. xiii.

It is to Daubenton that we are indebted for the discrimination of this fine species of European Bat. He has

described it and given a figure of the head, in the Memoirs of the French Academy for 1759; and Buffon subsequently gave it a place in his great work. The first notice of its occurrence as a British species is in White's "Natural History of Selborne," in which it is repeatedly mentioned. This writer gave it the name of *altivolans*, from a peculiarity which did not escape this close observer of nature.

We have seen it at Selborne for several successive years, and probably on the very spot where its venerable discoverer first observed it. In one summer, a pair of them came every evening out of a large beech in the grounds of the residence of one of the authors of this work, for their regular vespertinal flight. We have often seen them flying over the whole length of the beautiful ravine between the Lithe and Dorton wood, in Selborne, at an altitude equal to the tops of the trees on the hill on each side, and occasionally dipping down towards the stream to seize their insect food.

In Warwickshire, as in Hampshire, the Noctule appears to be a tree-loving species, not a single instance having come to our knowledge of its retirement to buildings during the day, although it has been frequently seen in the holes of trees. A grove of old oaks near Alcester, which was much frequented by the *Vespertilio Daubentonii*, was a favourite haunt also of the present species; and at Ragley, a seat of the Marquis of Hertford, in a similar grove, their excrement has sometimes lain so thick as to darken the ground under some of the more ancient trees. In another locality, near to Stratford-on-Avon, we have known a considerable number dislodged from a hole made by the green woodpecker in an elm, by the insertion of a flexible stick. Now, within convenient distance of these several localities,

ample accommodation in old buildings might have been found, and indeed was made use of by other species, but not a single Noctule took advantage of it, from which we may reasonably suppose, that although buildings may be occasionally made use of as a resting-place during the day, that this is only the case in the absence of trees which will afford sufficient accommodation.

The Noctule is gregarious in its habits, associating in considerable numbers, and seeking its retreat sometimes in the hollows of trees, at others under the roofs and eaves of houses. Pennant states that he was informed by the Rev. Dr. Buckhouse, that he saw taken from under the eaves of Queen's College, Cambridge, one hundred and eighty-five in one night: but as there is no reason to believe that these were all submitted to the rigid examination necessary to detect the specific distinctions of these animals, it is probable that other species were mingled with them in this great congregation. It is, however, particularly stated, that of all those which were measured; the extent of the wings was fifteen inches; and repeated observation has led us to believe that two gregarious species are rarely, if ever, found together. In the second night, sixty-three were taken. The flight of this Bat is remarkably high and rapid, and its cry when on the wing is sharp and harsh. It was observed by White to emit a very offensive odour. It remains in activity for a shorter time than any other, coming abroad later and retiring earlier: White says that he never saw it till the end of April, nor later than July, but its appearance in the spring and disappearance in the autumn depend entirely on the mildness of the season. The earliest note we have of its appearance is the 12th of March, and the 18th of September is the latest date we have on record of its appearance. In

both these instances solitary individuals were seen flying over the Warwickshire Avon.

Some observations by Mr. George Daniell, recorded in the Proceedings of the Zoological Society for 1834, on the habits of this species, and particularly on its parturition and lactation, are too interesting not to demand insertion here; and it would be doing injustice to the very pleasing manner in which the facts are detailed, were any part of them omitted. "On the 16th of May, 1834, Mr. Daniell procured from Hertfordshire five specimens of the *Vespertilio noctula*, four females and one male. The latter was exceedingly restless and savage, biting the females, and breaking his teeth against the wires of the cage, in his attempts to escape from his place of confinement. He rejected food and died on the 18th. Up to this time the remaining four continued sulky; but towards evening they ate a few small pieces of raw beef, in preference to flies, beetles, or gentles, all of which were offered to them; only one of them, however, fed kindly. On the 20th one died, and on the 22nd two others, each of which was found to be pregnant with a single fœtus. The survivor was tried with a variety of food, and evincing a decided preference for the hearts, livers, &c. of fowls, was fed constantly upon them for a month. In the course of this time large flies were frequently offered to her, but they were always rejected, although one or two May-chafers, *Melolontha vulgaris*, were partially eaten. In taking the food, the wings were not thrown forward, as Mr. Daniell had observed them to be in the *Pipistrelle*; and the food was seized with an action similar to that of a dog. The water that drained from the food was lapped; but the head was not raised in drinking, as in the *Pipistrelle*. The animal took considerable pains in cleaning herself, using the posterior

extremities as a comb, parting the hair on either side from head to tail, and forming a straight line along the middle of the back. The membrane of the wings was cleaned by forcing the nose through the folds, and thereby expanding them. Up to the 20th of June the animal fed freely, and at times voraciously; remaining during the day, suspended by the posterior extremities, at the top of the cage, and coming down in the evening to its food: the quantity eaten sometimes exceeded half an ounce, although the weight of the animal itself was no more than ten drachms. On the 23rd, Mr. Daniell, observing her to be very restless, was induced to watch her proceedings. The uneasiness was continued for upwards of an hour; the animal remaining during all this time in her usual attitude, suspended by the posterior extremities. On a sudden she reversed her position, and attached herself by her anterior limbs to a cross wire of the cage, stretching her hind legs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane so as to form a perfect nest-like cavity for the reception of the young. In a few moments the snout of the young one made its appearance, and in about five minutes the whole of its head was protruded. The female then struggled considerably until the extremities of the radii had passed; after which the young one, by means of a lateral motion of its fore limbs, relieved itself. It was born on its back, perfectly destitute of hair, and blind. The mother then cleaned it, turning it over in its nest; and, afterwards resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suckling. The time

occupied in the birth was seventeen minutes. At the time of its birth, the young was larger than a new-born mouse; and its hind-legs and claws were remarkably strong and serviceable, enabling it not only to cling to its dam, but also to the deal sides of the cage. On the 24th, the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her usual position was reversed. In the evening she was found dead; but the young was still alive, and attached to the nipple, from which it was with some difficulty removed. It took milk from a sponge, was kept carefully wrapped up in flannel, and survived eight days; at the end of which period its eyes were not opened, and it had acquired very little hair. From these observations, it is evident that the period of gestation in the Noctule exceeds thirty-eight days."

The Noctule, in general conformation, is essentially adapted for the capture and mastication of coleopterous insects. The broad muzzle and strong jaws are found quite equal to the reduction of the stubborn elytra of beetles as large as the cockchafer (of which, according to Kuhl, he will consume as many as thirteen, one after the other), and the wings are in no way deficient in power when in pursuit of these insects. During the fine midsummer evenings, when the cockchafers have become abundant, and you hear them humming on every side, the Noctule is in his glory. Then he flies high and straight, and you hear his shrill but clear voice as he passes overhead, interrupting himself only to dart at some prey, and then passing on. But an observer will not watch his movements long on such occasions with-

out noticing a manœuvre which at first looks like the falling of a tumbler pigeon, but on closer observation proves to be simply a closing of the wings, and a consequent drop of about a foot. Sometimes this is repeated every few yards, as long as in sight. It is occasioned by some large and intractable insect having been captured, and the anterior joint of the wing, with its well-armed thumb, is required to assist in retaining it until masticated. Sometimes, however, food is not so readily obtained. With a cold east wind, or indeed a strong wind from any quarter, a change of hunting ground is required, and the Noctule may often be seen taking a humble and silent flight in some sheltered corner, fluttering about with half-closed wings, and appearing to be very little at home, or, indeed, like himself, for we can recall an instance when several were shot under the belief that they were of some unknown species.

The geographical range of the Noctule is very considerable. As a British species it appears to be confined to England, and the most northern locality from which we have received specimens is Northallerton, in Yorkshire. In Europe, it appears to be pretty generally distributed; M. Temminck says, more abundantly in the central than northern part. It is included by Nilsson in his "Skandinavisk Fauna," by Brandt in his "Säugethiere Russlands;" by Schinz in his "Fauna Helvetica," and by Prince Lucien Bonaparte in his "Fauna Italica." But it occurs in Asia also, and in Africa. Specimens have been sent to the Leyden Museum from Japan; and from an examination of the type of Mr. W. Hodgson's *Scotophilus labiatus*, from Nepaul, we are convinced that it is no other than the present species. Many specimens have been sent with

other European Bats from North Africa, and it has been discovered on the Mozambique coast by Dr. Peters, and described as *Vesperugo macuanus*.

This Bat is the largest of the British species, excepting *V. murinus*, which exceeds it in length by about half an inch. The head is flat and broad; the muzzle broad, obtuse, and nearly naked; the mouth wide; the nostrils tumid at the upper and inner margin, and slightly channelled on the outer side. The ears are wide apart, shorter than the head, oval, the external margin with a rather deep fold near the base, from which it is produced downwards and forwards, below the corners of the mouth. Tragus very short, narrow at its base, then suddenly expanded into a broad, rounded, or reniform head, which is rather thick, and covered with numerous minute papillæ. Fur soft, moderately long. The tail longer than the fore-arm, its termination curved inwards, and projecting rather more than a line beyond the interfemoral membrane, which is thicker and more opaque than the other parts of the flying membrane, and is furnished with about fourteen or sixteen transverse lines. The colour of the fur is a reddish brown, scarcely darker above than beneath; the ears, muzzle, and membrane, dusky,—the latter darker and thinner towards its margin.

It is remarkable that Geoffroy has described this Bat under the name of *Serotine*, and the latter under that of *Noctule*, in his paper on the genus *Vespertilio*, in the *Annales du Muséum*. His descriptions of the two species are good, but misapplied; in proof of which I need only quote the following observations which occur under the head *Serotine*. Speaking of its distinctions from *Noctule*, he says, “ Il en diffère par l’oreillon, qu’il a plus court,

arqué, et terminé par une large tête, ou une espèce de paume." Nothing can be more correct than this discrimination, *mutato nomine*.

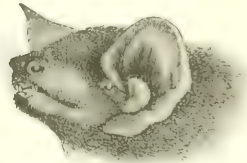
Dimensions :—

	Inch.	Lines.
Length of the head and body	2	11
„ of the head	0	10
„ of the tail	1	8
„ of the ears	0	7½
Breadth of the ears	0	6
Length of the tragus	0	2
„ of the fore-arm	2	0
Extent of the wings, 13 inches 8 lines to 14 inches and upward		

Dentition :—

$$I. \frac{1}{6} : C. \frac{2}{3} : F. M. \frac{1}{1} : M. \frac{6}{6} = \frac{16}{18}.$$

The genus *Scotophilus* was established by Dr. Leach, in a paper in the Linnæan Transactions, vol. xiii., and adopted by Dr. Gray in the Magazine of Zoology and Botany, vol. ii., 1838.



CHEIROPTERA.

VESPERTILIONIDÆ.



HAIRY-ARMED BAT.

Scotophilus Leisleri.

Ears oval-triangular, shorter than the head ; tragus barely one-third the length of the auricle, terminating in a rounded head ; fur long, bright chestnut above, brownish grey beneath : under surface of the flying membrane with a broad band of hair along the fore-arm.

<i>Vespertilio dasycarpus</i> ,	LEISLER.
„ <i>Leisleri</i> ,	KUHL, Deut. Flederm. p. 46, sp. 6. DESMAR.
	Mammal. p. 138. JENYNS, Brit. Vert. p. 23.
<i>Scotophilus</i> „	GRAY, l. c.
<i>Vesperugo</i> „	BLAS. l. c. p. 56, f. 35, 36.

ALTHOUGH the name retained for this species is not the one which was originally applied to it by its discoverer, Leisler, we have preferred continuing that by which Kuhl conveyed a well-merited compliment to that naturalist, who has contributed so much to our know-

ledge of European Bats. Were it not for this reason, it would have been desirable to restore the former term, which is founded upon a marked distinctive character, and the meaning of which we have still endeavoured to convey in the English name now chosen for it.

It was first discovered in Germany by Leisler, and is described by Kuhl; but I am not aware that it has ever before been figured. The present representation was taken from a specimen in the British Museum, the only one known to have been found in this country when the former edition of this work was published. Since that time it has been taken in Ireland, in a cave by the Blackstaff river, near Belfast. It was communicated to Dr. Kinahan by Mr. Patterson, and we have received from the former gentleman a full description, which leaves no doubt of the identity of the species. The same accurate observer has informed us of the capture of another specimen at Belvoir Park, Co. Down, several years since, and now in his possession. We have seen a British-killed specimen in the collection of Mr. F. Bond, and have good reason for supposing that it has been taken in the neighbourhood of Cirencester. These instances, added to its not unfrequent appearance at various localities in the course of the river Avon, in the counties of Warwick, Worcester, and Gloucester, render it probable that it is less rare than has hitherto been supposed. The following notes of its habits, as observed in Warwickshire, will not perhaps be considered unacceptable by our readers.

Previously to 1819, a Bat had often been observed which, from its smaller size and different mode of flight, appeared to be quite distinct from the Noctule; but it was not until June of that year that an opportunity occurred of examining a specimen; the difficulty of obtaining specimens arising not so much from its rarity

as from its general habit and style of flying. Whilst the Noctule may throughout the whole of the summer be seen taking its regular evening flight, night after night, near the same spot, the Leisler's Bat, on the contrary, will be seen once, perhaps for a few minutes only, and then lost sight of. It appears to affect no particular altitude in its flight any more than it preserves a regular or prescribed beat. When the weather is fine, you may see this Bat passing on in a kind of zig-zag manner, apparently uncertain where to go, generally, though not always, at a considerable elevation, and in a few minutes it is gone. Such was for several years the only knowledge we had of this species, but several examples were afterwards seen frequenting small wooded enclosures near the village of Welford, situated on the Avon a few miles west of Stratford. In these latter instances their flight was more circumscribed; but even then their desultory manners were quite remarkable, and they always appeared shy of approach. In 1853 a pair appeared in an enclosure at the village of Cleeve Prior, near the Avon, between Stratford and Evesham. This was about the middle of May. One of them, a male, was shot, and the other immediately took its departure. Since that time others have been shot near the village of Welford. Of the hiding-place of the Leisler's Bat we know nothing from our own observation, but, from its appearing more frequently near villages than elsewhere, are led to suspect that it is not, like the Noctule, a tree-loving species. Those observed at Cleeve Prior were abroad early in the evening, first appearing scarcely a hundred paces from the church tower, and a shorter distance than that from an ancient stone house and farmstead, built by the monks of Evesham Abbey, and around which other Bats were seen in plenty.

Temminck says that this Bat habitually retreats to the holes of trees in the vicinity of stagnant water, a statement the accuracy of which we are much disposed to question. As it does not, according to him, occur in France or the Low Countries, it is possible that he may not have himself observed it in a state of nature. Two Swiss specimens which we have examined are labelled thus: "Trouvé dans un vieux bâtiment dans le village Meyrengen au printemps;" which statement probably conveys a pretty accurate idea of the resting-place of this species.

The Hairy-armed Bat has been found in Germany and in Switzerland, and we have seen specimens in the collection of M. Verreaux of Paris, which had been received by him from Sicily. Eversman includes it in his list of species of the Ural Mountains, and Brandt, in his work on Russian Mammals, mentions its occurrence near the river Volga. We possess specimens from Madeira, and have reason to suppose that it occurs also with the Noctule in Algeria.

The head is short and flattened; the muzzle rather elongated; the nose depressed and naked; the nostrils crescent-shaped; a large sebaceous gland exists above the commissure of the lips. Ears hairy on the inner surface, oval-triangular, two-thirds the length of the head, very broad; the outer margin not reaching to the corners of the mouth; tragus half the length of the ear, terminating in a rounded head, which is slightly curved inwards, and produced on its outer margin. A band of short hair, about four lines in breadth, extends along the inferior surface of the fore-arm to the wrist, being thickest and most extended about the latter part. Fur long; above deep brown at the base, bright chestnut at the surface; beneath dusky at the base, dark greyish brown at the surface. The two Swiss specimens to

which we have alluded approach in colour to a fuliginous-brown on all parts, and tinged with ash-colour. Flying membrane dusky; the part contiguous with the body generally hairy both above and beneath; but in some specimens this peculiarity is by no means conspicuous. Thumb short and feeble.

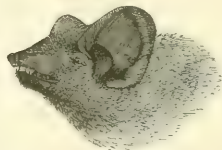
The colour is said to be much darker in young than in old specimens; a circumstance which is also observed in some other species, as *V. Daubentonii*, the Pipistrelle, &c.

Dimensions :—

	Inch.	Lines.
Length of the head and body	2	6
„ of the head	0	9
„ of the tail	1	8
„ of the ears	0	5
Breadth of the ears	0	4
Length of the tragus	0	1½
Extent of the wings	11	3

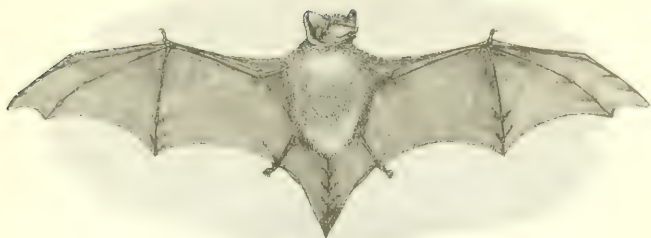
Dentition :—

$$I. \frac{1}{1} : C. \frac{2}{2} : F. M. \frac{4}{4} : M. \frac{6}{6} = 16.$$



CHEIROPTERA.

VESPERTILIONIDÆ.



PARTICOLOURED BAT.

Scotophilus discolor.

Ears about two-thirds the length of the head, oval, with a projecting lobe on the inner margin; tragus of nearly equal breadth throughout, rather more than one-third the length of the auricle; fur above reddish brown, with the tips of the hairs white; beneath dirty white.

<i>Vespertilio discolor</i> ,	NATTERER. KÜHL, Deut. Flederm. sp. 8, t. xxv. fig. 2. DESMAR, Mammal. p. 159. JENYNS, Brit. Vert. p. 24.
<i>Scotophilus</i> ..	GRAY, l. c.
<i>Vesperugo</i> ..	BLAS. l. c. p. 73, f. 49, 50.

THIS species, which belongs to the same genus as the Noctule, agreeing with it in the formula of its dentition, as well as in the short and obtuse character of the tragus, was first discovered on the Continent by Dr. Natterer, who found it in Germany. It is not, however, common in that country, and has not been observed in the central and northern parts, in Holland, nor, I believe, in any other part of the Continent. A single specimen, now in the British Museum, was taken at Plymouth by Dr. Leach, which appears to be the only one that has yet been noticed in this country. Its appearance in this country being confined to that of a

solitary example, together with its absence from the nearest parts of the Continent of Europe, lead us to suspect that the specimen obtained may have been conveyed to Plymouth in the rigging of a vessel. That Bats are so transported is more than mere surmise, as we can scarcely in any other way account for the appearance, in a living state, of a North American species (*Lasiurus pruinosus*) in the Orkney Islands, where it was obtained by the late Mr. J. Wolley. It is said to frequent towns, and indeed has not been seen in any other situations; and it comes abroad early in the evening.

The north and north-eastern parts of Europe appear to be its proper habitat, although we find no mention made of it by Nilsson in his Scandinavian Fauna. Eversman and Brandt severally include it in their works on the Bats of the region of the Ural Mountains, and on the Mammalia of Russia.

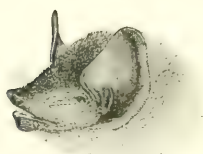
This is one of the most beautiful species of European Bats, from the richness of the prevailing colour of the fur, its marbled appearance arising from the lighter colour of the tips of the hairs, and the striking contrast between the upper and lower parts.

The forehead is broad and hairy; the muzzle broad, tumid, and very long; the nose thick and broad, and the lips tumid. The eyes are very small. The ears about two-thirds the length of the head, rounded, oval, turned outwards; the outer margin approaching the corners of the mouth, the inner margin with a distinct lobe at the base; the basal half of the ears hairy; tragus little more than one-third the length of the auricle, of equal breadth throughout, a little curved, opaque, and naked. Tail exerted for about three lines; bands of the interfemoral membrane, about nine or ten.

Fur of the upper part of a rich chestnut or very deep brown, the extreme points of the hairs being pale, in some specimens white, giving a variegated or marbled appearance; that of the under parts grey at the base, white at the tips, excepting a large patch occupying the middle of the chest and belly, of a reddish brown colour mixed with white.

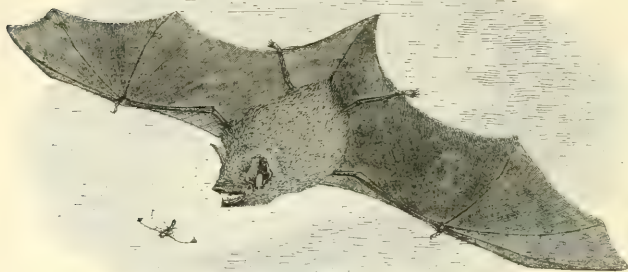
Dimensions:—

	Inch.	Lines.
Length of the head and body	2	8
,, of the head	0	10
,, of the tail	1	6
,, of the ears	0	6 $\frac{1}{2}$
,, of the tragus	0	2 $\frac{1}{2}$
Extent of the wings	10	6



CHEIROPTERA.

VESPERTILIONIDÆ.



COMMON BAT, FLITTER-MOUSE.

PIPISTRELLE.

Scotophilus pipistrellus.

Ears two-thirds the length of the head, oval-triangular, notched on the outer margin ; tragus nearly half as long as the auricle, almost straight, thickened, obtuse, and rounded at the apex : fur reddish brown above, paler beneath.

- Vespertilio pipistrellus*, GEOFFROY, Ann. Mus. d'Hist. Nat. VIII. p. 195
t. xlvii. xlviii. KÜHL, Deutschl. Flederm. sp.
12. DESMAR. Mam. p. 139. JENYNS, Linn.
Trans. XVI. p. 163. Id. Brit. Vert. p. 24.
- Scotophilus murinus*, GRAY, l. c.
- Vesperugo pipistrellus*, BLAS. l. c. p. 61, f. 39, 40.
- La Pipistrelle*, DAUBENTON, Mém. de l'Acad. des Sc. 1759, p. 381,
t. i. f. 3. BUFFON, Hist. Nat. VIII. p. 129,
t. xix.
- Common Bat*, PENNANT, Brit. Zool. p. 184.

WE owe to the Rev. L. Jenyns the elucidation of the synonymes of our Common Bat. In the 16th volume of the Linnæan Transactions, that gentleman has given an

elaborate and satisfactory paper on this subject, in which it is investigated with great acumen and judgment; and the conclusion which he draws, and which appears to be completely established, is, that the Common Bat of Britain is the Pipistrelle of the Continental authors.

The careless and implicit manner in which authorities are constantly followed without sufficient investigation, and error thus propagated from error, is as conspicuous in the present case as in most that could be adduced. Because *Vespertilio murinus* was the Common Bat of the Continental naturalists—their “Chauve-souris” *par excellence*—it was presumed that *our* Common Bat must be the same species; and Pennant having once stated such to be the case, every subsequent writer on our British Mammalia has copied the mistake; and *V. murinus*, one of the rarest of our indigenous species, was still to be the Common Bat of Britain. It was left to Mr. Jenyns to correct this long-established error; and it is sufficient to refer to his paper every one who wishes to be satisfied on the matter. We have carefully followed out the comparisons instituted by Mr. Jenyns, and can come to no other conclusion than that which he has established. The synonymes, therefore, of all our British Faunists, from Pennant down to Fleming inclusive, are erroneous as regards the present species.

From the commonness of this Bat, from the duration of the period of its activity, appearing earlier and retiring later than any other, and from its frequenting the neighbourhood of our dwellings, we have become better acquainted with its habits than with those of any other, if we except perhaps the Long-eared Bat, *Plecotus auritus*, which is indeed, in some places, as common as this. The Pipistrelle makes its appearance, after its short period of torpidity, as early as the middle of March, and does not

wholly retire into a state of undisturbed hibernation until the winter has decidedly set in: its torpidity, therefore, can hardly be said to continue more than from two to three months. A specimen was shot by Mr. Gould, in the middle of a bright, sunny, but frosty day, just before Christmas. Their final retirement does not depend exclusively upon temperature; for although before the severe frosts set in they continue to fly even when it is below the freezing point, they do not again appear until the time above mentioned, notwithstanding the thermometer, as Mr. Jenyns has observed, may have often risen considerably above 50° of Fahrenheit. This peculiarity is of easy solution. The fondness of the animal for different species of gnats has been observed even from the earliest period;* and from the diminutive size of the *Pipistrelle*, it is probable that these little insects constitute its principal food. These and many other dipterous insects, after having disappeared during the ungenial fogs and rains of the close of autumn, often make their appearance again in smaller numbers, on every fine warm day, until the severe cold of the depth of winter finally destroys the greater part of them. The same impulse of hunger equally accounts for the appearance of the *Pipistrelle* in the daytime at this period of the year; and it is only at that time that the temperature is sufficiently elevated to summon into temporary activity its insect food.

Mr. Jenyns remarks, that each species of Bat appears to have its own peculiar place of concealment; and that while the *Noctule* resorts to hollow trees, and the *Long-eared Bat* to roofs of houses, the present species is found in "crevices of decayed brick walls, in the cracks of old door-frames, or behind the leaden

* "Et in cibatu culices gratissimi."—*Plin.*

pipes frequently attached to buildings for carrying off the rain." That such are the usual situations for these respective species, Mr. Jenyns' statement would be a sufficient authority, even were it not amply confirmed by other observations: but that Bats are not so exclusive in their places of hibernation as may seem to be implied by the previous observation, has appeared to us equally true, since we have received from one chalk cavern at Chisellhurst, *Vespertilio Nattereri*, *V. mystacinus*, *Plecotus auritus*, and *Barbastellus*, all taken at one time: and it is clear that such retreats as are formed by art *cannot* be considered in the light of original and natural situations of retirement.

More extended observations have, however, led us to the belief that certain species do affect peculiar situations in which to rest during the day, and that others are altogether indifferent so long as they meet with the necessary shelter. These latter in all probability are mostly solitary species, the gregarious ones appearing to be much more particular in their choice of resting-places.

The Pipistrelle is by no means fastidious in this respect. As mentioned in the first edition of this work, it is sometimes found "under the roofs of houses, and in crevices of buildings of every description," and it might have been added, "either inside or out." An example has been taken from a hole in the thatch of a low shed in a brickyard, in which men were constantly at work, and we have seen one taken from a pile of hurdles in a stack-yard, which was being removed, but we cannot call to mind an instance in which corn stacks were made use of as a retreat. The inside of an old and disused wooden pump has on another occasion been found a suitable resting-place, the Bat having been seen to emerge from

the spout. It is probable that trees are much less frequented by this species than by some others, though one instance has come to our knowledge of its capture from behind a piece of loose bark on a decaying pollard willow by the side of the Avon, near Stratford.

In its choice of nocturnal haunts, the Pipistrelle is not less varied than in its selection of a resting-place. Wherever the Whiskered Bat is seen, this species may be seen also, that is, in all sorts of sheltered corners, and occasionally we have shot it while flying over the surface of the Avon in company with *Vespertilio Daubentonii*. But by far the most commonplace resort is the sheltered corner of an orchard, stackyard, farmyard, lane, or indeed any other quiet spot near a homestead, and we have sometimes been led to suppose that the abundance of flies which generally accompany cattle may account for the preference which it gives to the vicinity of farm-buildings. In mode of flight, the present species more nearly resembles the Whiskered Bat than any other, and when flitting—or rather vibrating—together in the “leafy month of June,” it is no easy matter to distinguish them. However, it may be said that, *generally*, while the Whiskered Bat often feeds *in* the trees, the Pipistrelle feeds *near* them, and takes its food wholly on the wing. The former of these, we have good reason to believe, often takes insects which are resting on the leaves of trees and hedges.

It is remarked by Geoffroy, that the Pipistrelle is not unfrequently found on the ground, worn out with ineffectual efforts to regain its flight, from its not finding an elevated spot from which to fall. This observation is totally incorrect as to the present, and probably every other species. We have often seen the Pipistrelle rise from a plane surface with a sort of spring, instantly

expand its wings and take flight. This was repeated by a single individual, in the library of the author of the first edition of this work, several times in the course of an hour, and without the slightest appearance of difficulty or effort: it was, on the contrary, evidently a natural and usual action. The same habit was observed in *V. Nattereri* and *Plecotus auritus*. In its progression on the ground, however, it differs considerably from some others, and particularly from the last-mentioned species. The *Plecotus*, in crawling or walking along a horizontal surface, has the anterior part of the body considerably elevated above the ground, and its progression is effected by a succession of abrupt impulses or leaps of one side after the other; whilst the Pipistrelle, which never raises the head from near the ground, runs along in an almost prostrate position, but at the same time with more celerity and freedom than any other that we have had an opportunity of observing. In climbing it evinces a corresponding degree of agility.

But there is one circumstance of considerable interest which we have observed in this species, which does not appear to have been before noticed, and which, it is probable, appertains in a more striking manner to others. It is the prehensile character of the extremity of the tail. A small portion of the tail in this and in most other species of this family is exerted beyond the margin of the interfemoral membrane. Not only does the animal employ the tail in horizontal progression—in which case it assists in throwing forward the body, by being brought into contact with the ground on either side alternately, corresponding with the action of the hinder foot on the same side,—but in ascending and descending a rough perpendicular surface, this little caudal finger holds by any projecting point,

and affords an evident support. This is particularly conspicuous when the Bat is traversing the wires of a cage, in which situation the fact was first observed.

It has been generally said that Bats bring forth two young ones at a time. Pliny says, "*geminos infantes secum deportat.*" The observations of Mr. Daniell and others, however, both on the Noctule and the Pipistrelle, would show that this is not a general rule. Four females of the former received in May 1834, and five of the latter in July 1833,—the only specimens sent to him, excepting one male Noctule,—had each of them a single fœtus, and the examination not merely of British species, but of a great number of foreign ones, has convinced us that when more than one young one is produced, it must be regarded as an exception to the general rule.

The gentleman just mentioned kept the Pipistrelles for some time, feeding them principally on flies, though they will also readily take small pieces of raw beef. "On the approach of a fly within the range of the Bat's wings, it was struck down by their action, the animal itself falling at the same moment with all its membranes expanded, and covering over the prostrate fly, with its head thrust under to secure its prey. When the head was again drawn forth, the membrane was closed, and the fly was observed to be almost invariably taken by the head."

The fondness of the Common Bat for flesh, to which allusion has just been made, leads it not unfrequently to find its way into our larders, where it has been found clinging to a joint of meat, in the act of making a hearty meal from it. It is probable that other species commit similar depredations, as it is not difficult to keep most of them in confinement by feeding them exclusively on raw meat.

The Pipistrelle is the least of the British species, and,

excepting in the very great difference of size, bears considerable general resemblance to the Noctule. The following description is so accurate and complete, that I have adopted it verbatim from Mr. Jenyns' paper; and I have preferred it to a less extended one, as the identification of this species is, as has been stated, a matter of no small interest:—

“Head much depressed in front, convex behind, with the upper part of the occiput remarkably protuberant; no occipital crest. Muzzle extending three lines beyond the ears; in young specimens rather elongated—which appearance wears off afterwards, from the enlargement of the head and the filling up of the sides of the face, when the profile is somewhat altered. Nose obtuse at the extremity, and slightly emarginate between the nostrils; these last reniform, with tumid edges: on each side of the nose, immediately above the upper lip, is a protuberant swelling, formed by a congeries of sebaceous glands, which when cut through are of a yellowish white colour. Eyes round and very small, situate half way between the above glands and the ears, and sunk deep in the head; over each, immediately above the anterior angle, is a small elevated wart furnished with a few black hairs; a transverse tuft of rather long upright hair on the forehead, which has the effect of making the head appear more elevated than it really is: rest of the face, including the cheeks, contour of the eyes, and space above the nose, almost naked, particularly in young specimens. Auricle broad, rather more than half [about two-thirds] as long as the head, oval approaching to triangular, deeply notched on its external margin about midway down: tragus [nearly] half the length of the auricle, oblong, and terminating in a rounded head, nearly straight, or slightly bending inwards. In the upper jaw four

incisors—on each side two, of which the first is longest; in the lower jaw six, each of which has three lobes: grinders five on either side, above and below; the first in the upper, and the two first in the lower jaw, with only one point: of these last-mentioned teeth, the second is longer than the first; the other grinders in the lower jaw have each five points, three on the inner and two on the outer margin, which last are alternately long and short. Fur rather long and silky, yellowish red on the forehead and at the base of the ears; on the rest of the upper parts reddish brown, with the lower half of each hair dusky: on the under parts the hair is wholly dusky, except at the extreme tips, which are of the same colour as above, but paler. In young specimens the fur is entirely of a dusky brown or brownish grey, in some instances almost black, without any tinge of red, which appears to come afterwards, and to increase in intensity with the age and size of the individual. Nose, lips, ears, flying and interfemoral membranes, dusky."

Dimensions :—

	Inch.	Lines.
Length of the head and body	1	7
„ of the head	0	6
„ of the tail	1	2
„ of the ear	0	4
„ of the tragus	0	2 nearly.
Breadth of the ear	0	3
Length of the fore-arm	1	2
Extent of the wings	8	4

Dentition :—

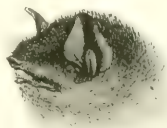
$$I. \frac{4}{6} : C. \frac{2}{2} : F. M. \frac{4}{4} : M. \frac{6}{6} = \frac{16}{18}.$$

We insert here the figure of *Vespertilio pygmaeus*, which was given in the first edition of this work, but we do not deem it necessary to add a description, as there is now no longer any doubt that it is a young *Pipistrelle*;

the bones of the wings and cranium indicating extreme youth. We have compared young individuals of the Pipistrelle with Leach's original specimen in the British Museum, and find them identical.



Dr. Schinz, in the first volume of his work on the European Fauna, has described a small Bat under the name of *Vespertilio minutissimus*, of which we have seen a specimen. It is obviously the young of the Pipistrelle, at a somewhat more advanced age than the one of which the above figure is an illustration.



CHEIROPTERA.

VESPERTILIONIDÆ.



THE SEROTINE.

Scotophilus serotinus.

Ears oval-triangular, shorter than the head; tragus semicordate, curved towards the head, little more than one-third the length of the auricle; fur chestnut brown above, yellowish grey beneath.

- Vespertilio serotinus*, GÆMEL. DESMAR. Mammal. p. 137. KÜHL, Deutsch. Flederm. sp. 9. GRAY, Zool. Journ. II. p. 169. JENYNS, Brit. Vert. p. 22.
 „ *noctula*, GEOFF. Ann. Mus. VIII. p. 193, t. xlvii. xlviii.
Scotophilus serotinus, GRAY, l. c.
Vespertilio turcomanus, EVERS. Bull. de Mosc. 1840, i. p. 21.
 ?——*megalurus*, TEMM. Mon. de Mam. t. ii. p. 206.
Vesperugo serotinus, BLAS. l. c. p. 76, f. 51, 52.
La Serotine, DAUBENT. Mém. Acad. 1759, p. 380, t. ii. f. 1. BUFFON, Hist. Nat. VIII. pp. 119, 129, t. xviii. f. 2.

THE SEROTINE, notwithstanding the clear and intelligible description of Daubenton, was mistaken for the Noctule by Geoffroy, who described the one for the other. It was discovered by Daubenton, and forms one of the subjects of his excellent paper on the Bats in the Memoirs of the French Academy for 1759. It was also

described and well figured in the eighth volume of Buffon's great work.

It appears to have very much the habit of the Noctule, at least as far as regards its late appearance in the spring, its sound and long-continued slumber. It flies from evening till morning, when the state of the atmosphere is favourable. In France, where it is far from being rare, it frequents forests, where it flies amongst lofty trees; it is also commonly found amongst the huge piles of wood in the timber-yards of Paris, seeking its place of repose on the tops of the highest piles. With us it appears to be a local species, appearing only in the south-eastern parts of our island. It is said to occur in the neighbourhood of London, and we have examined a considerable number of specimens from Folkestone, and the Isle of Wight. We think it highly probable that it may be more common in the southern counties than is generally supposed, as from its size it would be readily confounded with the Noctule. All our endeavours to meet with this fine species in the midland counties have proved unavailing, nor can we learn that it has ever been met with in the West of England. Its flight is slow. It shuns society more than most other Bats, being generally found either solitary or in pairs. It has only one young one at a birth, about the end of May in France, probably somewhat later in this country. It is found in Germany, Holland, France, Switzerland, and the Pyrenees, and is included by Dr. Eversman in his descriptive catalogue of the Bats of the Ural Mountains. Prof. Brandt also mentions the Serotine in his work on the Mammals of European and Asiatic Russia. We find it given by M. Nordman in his Natural History notes appended to the travels of M. Demidoff, in Southern Russia and the Crimea. He says it was found in "Bessarabie, et dans le gouvernement d'Ekaterinoslaw." It

is probable, however, that in its geographical range this species is not confined to Europe, nor even to the adjacent parts of Asia, but that it is rather widely distributed in the latter quarter of the globe, since we have great reason for supposing that it occurs in India and in China. Hitherto we have not seen specimens from Japan, although other European species have been received from there; and neither does it appear to have been received, with the *Noctule* and *Vespertilio murinus*, from North Africa; but we are persuaded that the *Vespertilio megalurus* of M. Temminck, from Southern Africa, specimens of which have recently been examined in the Leyden Museum, is no other than the young of the Serotine.

The face is almost naked; the muzzle short, broad, and tumid; the nose is about a line and a half across; the nostrils rounded; the upper lip is furnished with sebaceous glands, from which spring a few hairs; the forehead is very hairy; the ears are oval, somewhat triangular, shorter than the head, the inner margin much arched; the apex obtuse, rounded, and bending outwards; the basal half hairy on the outer surface, the rest naked; the tragus elongate, semicordate, pointed at the extremity. The teeth are fewer in number than in any other British species of this family, there being only thirty-two, as in *Rhinolophus*. The tail is exerted to the extent of three lines.

The general colour of the fur in the male is a deep rich chestnut brown on the upper parts, passing into yellowish grey beneath; that of the female much brighter. The hair is long, glossy, soft, and silky. The membranes are dark brown, approaching to black.

The Serotine appears liable to greater variation in colour than any other European Bat. From the Isle of Wight, and from Folkestone, we have seen specimens

having a decided greyish tinge, and of somewhat greater size than usual. Specimens, on the contrary, from the Asiatic foot of the Ural Mountains, are without the least appearance of grey or brown, all the upper parts being of a uniform yellowish cream colour, the fur very long and silky. The under parts of this beautiful variety are of a tarnished yellowish white colour. From India, and from the Island of Amoy, specimens of a Bat have been received which differs only from the Serotine, in all external characters, in having the fur of a dark brown, tipped on the upper parts with whitish brown, and giving the animal somewhat the appearance of the *Scotophilus discolor*. M. Temminck's examples of *Vespertilio megalurus* differ only from ordinary young individuals of the Serotine in having all the fur paler, that which is on the membranes being cream-coloured.

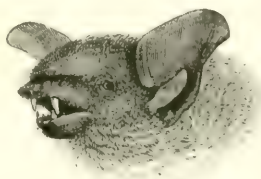
In young individuals the head is more round and thick in proportion, the muzzle shorter and more obtuse, the lip very tumid, and the colours more obscure, than in the adult.

Dimensions :—

	Inch.	Lines.
Length of the head and body	2	8
.. of the head	0	11
.. of the tail	1	10
.. of the ears	0	8
.. of the tragus	0	3
Extent of the wings	12	4

Dentition :—

I. $\frac{4}{6}$: C. $\frac{6}{2}$: F. M. $\frac{2}{4}$: M. $\frac{6}{6}$ — $\frac{11}{13}$.



CHEIROPTERA.

VESPERTILIONIDÆ.



MOUSE-COLOURED BAT.

Vespertilio murinus.

Ears oval, broad at the base, becoming narrower towards the apex, as long as the head; tragus falciform, the inner margin straight, not quite half the length of the auricle: fur varying from greyish brown to pale reddish brown above, dirty white beneath.

<i>Vespertilio major</i> ,	BRISSON, p. 214, No. 5. LINN. Syst. Nat.
„ <i>murinus</i> ,	LINN. Syst. Nat. GEOFF. Ann. Mus. VIII. p. 191, t. xlvii. xlviii. DESMAR. Mammal. p. 134. JENYNS, Brit. Vert. p. 20. BLAS. Faun. Wirb. Deutsch. p. 83, f. 56, 57.
„ <i>myotis</i> ,	KUHL, Deut. Flederm. p. 36, sp. 4.
<i>La Chauve-souris</i> ,	DAUBENT. Mém. de l'Acad. des Sc. 1759, p. 378, t. i. BUFFON, Hist. Nat. VIII. p. 113, t. xx.

IN the account of the Pipistrelle, the reasons have been detailed for abolishing the name of *Vespertilio murinus* as that of the Common Bat of Great Britain. On the Continent, indeed, this species is very generally met with.

It was probably the species known to the Greeks by the name of *Νυκτερίς*, and may be considered as one of the most frequent in Germany, as well as in France and in many other parts of Europe; but in England it is one of the rarest species yet discovered to be indigenous to the country, and has hitherto only been taken in the gardens of the British Museum. From the large size of this species, and consequently the comparative ease with which specimens could be obtained, we cannot help thinking that were it, properly speaking, an inhabitant of our islands, other examples would by this time have been captured. Yet we have failed in meeting with any other record of its appearance than that above given, which is not altogether satisfactory. When we recollect that previously to the labours of the Rev. L. Jenyns, the *Pipistrelle* was confounded with the *Vespertilio murinus* by English naturalists, it will at once appear as by no means improbable, that the confusion of the two may have led to the record of the present one as a British species. It is one of the largest of the European Bats, exceeding even the *Noctule* in the length of the body by about half an inch, and in the extent of the wings by full an inch. In those countries where it exists in the greatest profusion, it is found by hundreds together, in ancient buildings, in the towers of churches, and other similar retreats; but it does not resort to forests or woods, as many other species do. It is not found associated with others; and even amongst themselves, they frequently have violent and bloody quarrels, fighting with their sharp teeth, and holding on to each other by their hooked thumbs, sometimes tearing each other, and even breaking the slender wing-bones of their antagonists.

They feed on various kinds of nocturnal and crepus-

cular insects, particularly the nocturnal Lepidoptera ; the harder parts of which, with portions of the wings, are found unchanged in their excrements. Buffon relates, probably of this species, that having descended into the grottoes at Arcy for the purpose of examining the stalactites, he was astonished to perceive the ground covered, to an extent of many feet in breadth, with a thick layer of soil, formed principally of the remains of the wings, and hard parts of various insects, as if they had congregated there in countless multitudes to perish and rot together. It proved, however, to consist of the excrement of Bats which had suspended themselves from the roof of the grotto: the mass had probably been accumulating for very many years.

The head of this Bat is long ; the face sparsedly covered only with scattered, stiffish, long hairs ; the forehead very hairy ; the nose naked and smooth, prominent, extending beyond the lower lip ; the gape wide ; the nostrils opening laterally, the margins tumid. Eyes rather large, with a few long black hairs immediately above them. Ears inclining backwards, standing strongly out from the head, oval, broad at the base, becoming narrower and even a little pointed at the apex, as long as the head, with a few scattered hairs near the base on the inner margin ; tragus falciform, the tip sub-acute, and the inner margin quite straight.

Colour of the fur, above, pale reddish brown, beneath, greyish white, the hairs being all blackish at the base. Ears grey without, tending to yellowish within. Membranes yellowish brown, paler than in most other species. Specimens from North Africa are usually somewhat paler than European ones. Immature examples have the upper parts of a brownish grey colour, without any of the reddish brown colour of the elder ones.

Dimensions :—

	Inch.	Lines.
Length of the head and body	5	7
„ of the head	0	9
„ of the tail	1	7½
„ of the ears	0	11½
Breadth of the ears	0	5
Length of the tragus	0	5½
Extent of the wings	15	0

Dentition :—

$$I. \frac{1}{6} : C. \frac{2}{2} : F. M. \frac{6}{6} : M. \frac{9}{6} = \frac{18}{20}.$$





BECHSTEIN'S BAT.

Vespertilio Bechsteinii.

Ears oval, rather longer than the head ; tragus narrow, falciform, not half the length of the auricle : fur reddish grey above, greyish white beneath.

Vespertilio Bechsteinii, LEISLER. KÜHL, Duet. Flederm. p. 30, sp. 2, t. xxii. DESMAR. Mammal. p. 135. JENYNS, Brit. Vert. p. 21.

THIS handsome and striking species is rare in this country, being only known as British from the occurrence of specimens taken by Mr. Millard in the New Forest, and now in the British Museum. This locality corresponds with its habits as detailed by the Continental naturalists, who state that it resorts exclusively to the hollow trees in the midst of forests, never approaching towns or retiring to buildings. It shuns even all association with other species of Bats, congregating in small groups of about a dozen, the largest number observed together being thirteen, all of which were females.

The general resemblance of this species to *V. murinus* and to *V. Nattereri*, with both of which it agrees in the

essential points of the form of the tragus and the formula of the dentition, is very obvious on the most superficial observation. It is, however, readily distinguished from the former species by the larger size of the ears, the different proportions of the wings,—which, although equally broad, have not nearly the same relative length,—by the darker colour of the membrane, and the lighter colour of the belly. From *V. Nattereri* it differs in the entire and simple margin of the interfemoral membrane, in its larger size, and the greater length of its ears.

The face is rather hairy, with a few stiffer hairs intermixed; the muzzle long and conical; the gape wide, extending to the base of the ears; the nose rather narrow, and slightly depressed in the middle. Ears obviously longer than the head, rounded, and bending outwards at the apex, oval, thin, and transparent; tragus somewhat falciform, bending a little outwards towards the extremity. Fur reddish grey above, brown at the base, light grey beneath, blackish at the base. Dimensions:—

	Inch.	Lines.
Length of the head and body	2	2
„ of the head	0	9
„ of the tail	1	5
„ of the ears	0	10
Breadth of the ears	0	5
Length of the tragus	0	4
Extent of the wings	11	0

Dentition:—

$$I. \frac{4}{6} : C. \frac{2}{3} : P. M. \frac{6}{6} : M. \frac{6}{6} = \frac{18}{20}.$$



CHEIROPTERA.

VESPERTILIONIDÆ.



THE REDDISH-GREY BAT.

Vespertilio Nattereri.

Specific Character.—Ears oblong-oval, about as long as the head; tragus narrow-lanceolate, nearly two-thirds the length of the ear: interfemoral membrane with the margin crenate and stiffly ciliated, from the end of the spur to the tail: fur rufous grey above, whitish beneath.

Vespertilio Nattereri, KÜHL, Deutschl. Flederm. p. 33, sp. 3, t. xxiii. DES-MAR. Mam. p. 138. JENYNS, Brit. Vert. p. 23.

THIS species, to which the English name of Reddish-grey Bat has been applied, from its prevailing colour, was first described by Kuhl, and named by him after our friend Dr. Natterer, the celebrated Austrian Naturalist. In this country it appears to be of not unfrequent occurrence, though certainly local in its distribution. Those in the British Museum were taken near London; Mr. Jenyns gives Swaffham in Cambridgeshire as a habitat; we have seen specimens belonging to Mr.

Yarrell from Colchester and from Norwich; we have taken them at Selborne; and received three living ones, by the kindness of Dr. Waring, from Chiselhurst in Kent, where they were taken during their hibernation, in company with *Barbastellus*, *Vespertilio mystacinus*, and *Plecotus auritus*. They were found in a large chalk cavern, at the bottom of a shaft seventy feet in depth. These specimens continued alive for a short time, feeding on bits of raw meat, and exhibiting great familiarity of disposition, not only by their friendliness towards their companions, but by their readiness in taking food from the hand, and in allowing themselves to be interfered with without evincing fear or anger. One of them was one morning found dead, and partially eaten by his companions; and the remaining two died shortly afterwards. They were active in their habits, running about the cage and climbing with great agility; their attitude when running on a plane surface was more horizontal than that of the Long-eared Bat, though perhaps less so than the Pipistrelle, which runs along almost on its belly.

The discovery, in 1848, of a colony of these Bats in the church of the village of Arrow, situated on a small stream of that name near to Leicester, confirms in a very interesting manner the familiar and social habits of the species. Between the ceiling of the church and the tiled roof was a dark retreat, accessible by a low arch from a floor in the tower. Here the Bats were seen adhering, by all their extremities, to the under surface of the row of tiles which forms the crest or ridge of the roof (partly supported, however, by the upper tier of roof-tiles on which the ridge-tiles rested), and others clinging to them, until a mass was made up three or four inches thick, six or seven wide, and about four feet in length. It would be wrong to call this their place of

repose, as they presented a most singular scene of activity, the constant endeavour of those outside being to penetrate the mass, probably for warmth, and to do this they were continually poking their noses between those nearest to them, and then forcing in their bodies, to be in their turn again pushed to the outside. In this manner a regular bickering was kept up in the whole mass. However, they seemed to be very gentle, and to have no idea of biting or otherwise annoying each other.

On the boarded floor in the tower adjoining this retreat many dead ones were lying about, in a dried condition, all of them very small and hairless. These probably had fallen from their mothers when on the wing, as they were themselves too young to have flown there, and the parents could not have rested in this chamber, and at that time let fall their young.

After watching this remarkable assemblage for some time, about sixty were secured in a bag (only a very small proportion of the number there), and the bag was opened in a lighted room in the evening. They were soon flying about in all directions. On the window being thrown open, those nearest to it at once flew out; but so completely gregarious are these Bats, that after taking a turn or two outside they re-entered the room, and being joined by others, again went forth, and again returned, until all had become aware of the means of escape, when the whole company left the room in a cloud. We may add, as further showing the gregarious nature of the species, that a few which were retained, exhibited great uneasiness when separated from each other, which disappeared when permitted to be together.

The Natterer's Bat appears to be distributed over a considerable part of Europe. In England it is by no means rare, as the foregoing observations sufficiently

show. Hitherto we have met with no record of its occurrence in Scotland, but in Ireland, according to Dr. Kinahan and Prof. M'Coy, it has been taken in a rugged mountain pass between the counties of Dublin and Wicklow. It appears in Germany, but is probably not very common, since it is not included in a list kindly made out by our friend Dr. Albert Günther, the well-known ichthyologist. In Belgium, according to Baron De Selys Longchamps, it is less abundant than its congeners, but has been taken in the vicinity of Brussels, and at Maestricht. It is stated also to be a rare species by M. Hollandre, who met with it in the holes of trees in the neighbourhood of Metz. Prof. Brandt includes it in his work on the Mammalia of Russia, and it is also mentioned by Dr. Eversman as an inhabitant of the region of the Ural Mountains. We have received specimens from Warsaw, and find it given as a Scandinavian species by M. Nilsson. In the more southern parts of Europe, it is said to appear on the Adriatic and Mediterranean shores. The *Vespertilio emarginatus* of Prince Lucien Bonaparte, figured in his fine work on the Fauna of Italy, has been supposed by Prof. Blasius to be identical with the *Vespertilio Nattereri*; as, however, we have been able to make a direct comparison of the original specimen with those described by M. Geoffroy St. Hilaire, we are justified in stating that this is an error.

The head of this Bat is smaller in proportion than that of most others; the muzzle narrowed, projecting beyond the lower jaw, and naked at the extremity; the face is hairy, some of the hairs very long, scattered, and projecting in a sort of thin moustache over the lip; there is a prominent sebaceous gland on each side of the face above the lip. Nostrils oval, with tumid margins,

placed immediately above the margin of the lip. Ears oblong-oval, as long as the head, rather more than half as broad as they are long; the extreme inner margin reflexed; the outer margin scarcely notched, extending downwards and forwards to meet the inner margin at the base; tragus two-thirds as long as the auricle, very narrow, lanceolate, thin, and naked. Eyes very small. Flying membrane semi-transparent, naked; interfemoral portion with only eight transverse lines; the spur very long, and the margin of the membrane from the spur to the tip of the tail crenate, and furnished with a lash of stiff short hairs. Exserted portion of the tail very short.

The colour of this Bat is lighter than that of the other British species, with the exception of the *Vespertilio murinus*. The fur above, which is long and soft, is light reddish brown, with a grey glance, from the tips of the hairs being greyish, and the roots of the former colour. Beneath it is light silvery grey, the tips of the hair being white, and the roots nearly black. The ears and muzzle pale. The membrane smoky grey with a slight rufous tinge.

Dimensions:—

	Inch.	Lines.
Length of the head and body	1	11
„ of the head	0	8
„ of the tail	1	8
„ of the ears	0	8
Breadth of the ears	0	3½
Length of the tragus	0	5
Extent of the wings	11	0

Dentition:—

$$I. \frac{4}{6} : C. \frac{2}{2} : F. M. \frac{6}{6} : M. \frac{6}{6} = \frac{18}{20}.$$

Desmarest has given an erroneous statement of the number of teeth in this Bat: he says there are but five

molares on each side above. This mistake arose from the extreme minuteness of the two smaller false molares, which were doubtless taken for a single one; the dentition, in fact, corresponds exactly with that of *V. murinus* and *Bechsteinii*.





DAUBENTON'S BAT.

Vespertilio Daubentonii.

Ears oval, three-fourths the length of the head, very slightly notched on the outer margin, with a fold on the inner margin at the base; tragus narrow-lanceolate, rather obtuse, bending a little inwards, half the length of the auricle: tail longer than the body.

- Vespertilio Daubentonii*, LEISLER. KÜHL, Deut. Flederm. sp. 11, t. xxv.
 f. 2. DESMAR. Mammal. p. 141. BLASIUS, Faun.
 Deutsch. p. 98, f. 66, 67.
 „ *emarginatus*, JENYNS, Brit. Vert. p. 26.
 „ *ædilis*, JENYNS, Ann. Nat. Hist. 1839, p. 73.
 „ *macroductylus* TEMM. Mon. Mam. II. p. 231, pl. 58, fig. 3, 4, 5.
 „ *Volgensis*, EVERS. Bull. de Moscou, 1840, I. p. 24.

A CAREFUL examination of several specimens of the species described by Mr. Jenyns, in his most useful Manual, under the name of *Vespertilio emarginatus*, has led to the conviction that the Bat so designated by him is the true *V. Daubentonii* of Kuhl and Desmarest, and not the *V. emarginatus* of Geoffroy. Mr. Jenyns most

obligingly permitted the use of his specimen, which is an adult male, and was taken at Milton Park in Northamptonshire: our late revered friend Mr. Yarrell also kindly allowed the use of his specimens, consisting of an adult female, a half-grown male, and an extremely young one, all of which were taken at Islington. It was upon an examination of these that the statement respecting their identity with *Vespertilio Daubentonii* was made in the first edition of this work, a decision which has met with universal assent. The expression "oreilles petites," in Desmarest's essential character of *V. Daubentonii*, is so vague as to be useless, and at the same time conveys an idea which is absolutely erroneous; and were it not corrected by the statement of the actual length of the ears,—namely, half an inch,—it would greatly mislead any one who depended upon it. Such uncertain and arbitrary expressions in essential specific characters cannot be too strongly deprecated. In any group of animals in which the distinctive characters are not very obvious, and are frequently dependent upon the comparative dimensions of small or inconspicuous parts, it is of the greatest consequence that the relative proportions be accurately stated; and if this be done, they form the most certain and valuable marks of distinction.

So peculiar are the vespertinal habits of this species, that, while very abundant, an ordinary observer might be quite unconscious of its existence. It is essentially an aquatic species, if such an expression be admissible, applied to an animal which never enters the water. It haunts that element continually, flying so near its surface as to render it difficult to distinguish between the creature itself and its reflection. The flight, quivering and slow, is performed by very slight but rapid strokes of the

wings ; it may, indeed, be said to vibrate, rather than fly, over the surface of the water. It could not well fly in any other manner so near the surface without often striking it, and this it seldom, or perhaps never, does, although it often pauses to dip its nose into the water, whether to drink or pick up some floating food, we have been unable to ascertain. The Daubenton's Bat is, we suspect, rather an abundant species in the middle parts of England, at least it is plentiful in some parts of Warwickshire. We have sometimes seen these Bats so thick on the Avon, near to Stratford, that at certain spots there could not have been fewer than one to every square yard, and this abundance has extended over a very considerable space. It resorts indiscriminately to buildings or trees during the day, though we think the preference is given to the former. On one occasion we received a great number, which had been taken by some workmen from a grove of old oaks near to Alcester. Some of the trees were literally filled with these Bats exclusively, while in other trees in the same grove, but in a different part of it, the Noctule was equally abundant. A few miles from Alcester is Coughton Court, an ancient seat of the Throckmorton family, near to which passes a small stream called the Arrow, and in the grounds around the mansion is a chain of deep and dismal-looking ponds, overhung by alder and other moisture-loving trees. This is just the kind of haunt for the present species, and here it abounds. In the roof over a room in one of the outbuildings, their excrement has been seen lying on the ceiling an inch or two in thickness, every crevice overhead being crammed with Bats.

The following notes of a Bat-hunting expedition to the church of Stratford-on-Avon, will be interesting as further illustrating the habits of this species:—

On a fine September evening in 1849, a party of three ascended to the belfry for the purpose of collecting specimens, having been assured by the sexton that Bats abounded there. On the first appearance of one of these animals, some candles were lighted, and each one, according to instructions, taking hold of a bell-rope, swung it round as rapidly as possible, and the Bat, unable to avoid the rotating ropes, was soon struck by one of them and came to the floor. Others soon made their appearance, and were as speedily taken; and in this manner more than twenty were in a short time secured, all of which were of the present species. The least touch of the rope was sufficient to bring the Bat down, if it were merely on the tip of the wing, and the creature, with expanded and motionless wings, came to the floor, and if uninjured, as was usually the case, at once commenced running about on the boarded floor of the belfry. Having taken some of these specimens away, they were let loose in a well-lighted room, and the same peculiar kind of flight was observed as in the dusky belfry, and a similar predilection shown for ceiling, wall, and floor, keeping so close to these in their flight as sometimes to touch them with their wings.

Rarely did one in either place venture across the open part; and as rarely have we shot one of this species in an open place away from the surface of the water. Some of the specimens from Stratford Church, although shy at first, soon became assured, and were kept alive for some time. They were very quiet and gentle in their manners, and after a short time took milk from the palm of the hand quite freely. Very small pieces of meat, although at first refused, were afterwards eaten. But the common house-fly was the favourite morsel, and it was curious to see them poke their little noses between

the fingers for flies which were concealed there. A fly put on a smooth table was always a tempting but tantalizing bait for them, for the Bats, in attempting to take hold of it, almost invariably pushed it to the outside of the table, from which it fell and was lost. When a fly or other food was taken which was rather large, the carpus was always brought into use to do the office of a hand, and the food was pushed into the mouth with it, but it did not appear that the claw on the thumb was made use of; however, as at these times the nose was always thrust more or less downwards under the breast, it was not easy to make an accurate observation, from the operation being so much concealed by the body of the animal. Their constitution appeared delicate, and it was difficult to keep them alive for any long period; a good flight round the room in the evening appeared necessary to their existence, whilst the hardy little Pipistrelle and the Noctule will live in a box without exercise for a long time, if well supplied with food.

The most northern English locality for this species which has come to our knowledge is Durham, from which place the *Vespertilio adiiis* of the Rev. L. Jenyns, was obtained, which is now referred to *Vespertilio Daubentonii*; but in Scotland it has been met with as far north as Aberdeen, specimens having been deposited in the British Museum by Mr. John Macgillivray which had been collected near that place. So recently as the autumn of 1861 we received, through the kindness of the Rev. G. Gordon, a specimen which had been taken in the church of Peterculter, also in Aberdeenshire. Its occurrence in Ireland in two localities has been established; viz., in Donegal, by the late Wm. Thomson, and in Kildare by Dr. Kinahan.* It is found in various

* See Proc. Nat. Hist. Soc. Dublin, vol. ii. p. 154, et seq.

parts of Germany, is common at Hanau, in Wetteravia, and was taken by Dr. Natterer in Vienna. According to M. Temminck, it occurs in Sardinia, but not in the north of Europe, a statement which is certainly incorrect, as in the first edition of this work it was shown, on the authority of Dr. Beck, to be a Danish species, and we find it included by M. Nilsson in his Scandinavian Fauna, as well as by Prof. Brandt in his work on the Russian Mammals. Dr. Eversman has described a variety of this Bat under the name of *Vespertilio Volgensis*, which he met with on the slopes of the Ural Mountains, and near the river Volga. Finally, we add Japan to the enumeration of localities from which examples of *Vespertilio Daubentonii* have been received, as an examination of Japanese specimens in the Leyden Museum has satisfied us not merely that the Noctule occurs there, as stated by M. Temminck, but that the *Vespertilio macrodactylus* of that distinguished zoologist is referable to the species we have now under review.

The head is rather small; the forehead somewhat elevated, and the top of the head a little flattened; the muzzle obtuse, with numerous long and stiffish hairs, and a moustache of soft long hair on each side of the upper lip, which is also tumid from a congeries of sebaceous glands on each side. Ears of moderate size, about three-fourths the length of the head, oval, bending a little outwards; the external margin very slightly notched, the inner margin with a fold near the base. Tragus somewhat lanceolate, narrow, sub-acute at the apex, turned a little inwards, half as long as the ear. Tail a little longer than the fore-arm, exerted at the extremity for about a line. Hinder extremities robust; the feet strong, and the outer toe very distinct from the rest. Wing membranes extending only to the distal extremity of

the tibia, leaving the foot free, a character which at once distinguishes it from all other British species of the genus *Vespertilio* as restricted in this work. Interfemoral membrane ample; the transverse lines, as in *V. mystacinus*, very numerous. Fur soft, plentiful, brownish black at the base; the surface reddish brown above, sometimes dark brown and occasionally dark greyish brown, ash-grey beneath: younger individuals are usually darker, sometimes almost black. Membranes dusky, with a reddish tinge; the interfemoral whitish beneath.

Dimensions:—

	Inch.	Lines.
Length of the head and body	2	0
„ of the head	0	7
„ of the tail	1	6
„ of the ear	0	6
Breadth of the ear	0	3½
Length of the tragus	0	2½
„ of the fore-arm	1	4
Extent of the wings	9	0

Dentition:—

$$I. \frac{4}{0} : C. \frac{2}{2\frac{1}{2}} : F. M. \frac{6}{0} : M. \frac{6}{6} = \frac{18}{29}.$$



CHEIROPTERA.

VESPERTILIONIDÆ.



WHISKERED BAT.

Vespertilio mystacinus.

Ears oblong, bending outwards, shorter than the head, notched on the outer margin; tragus half the length of the auricle, lanceolate, a little expanded at the outer margin near the base; upper lip furnished with a moustache of long fine hair: fur blackish chestnut above, dusky beneath.

Vespertilio mystacinus, LEISLER. KÜHL, Deutsch. Flederm. sp. 14. DESMAR. Mammal. p. 140. GRAY, Zool. Journ. II. p. 109. JENYNS, Brit. Vert. p. 26.

THIS species was discovered by Leisler in Germany, where it is said to be rare. The first notice of its being an inhabitant of this country appears in Dr. Gray's enumeration of British *Vespertilionide* in the Zoological Journal. This gentleman supposes that Montagu mistook it for *Barbastellus*, and states that the specimen marked *Barbastellus* in the British Museum, which belonged to Montagu, is of this species. Mr. Jenyns has obtained it in Cambridgeshire and Northamptonshire; Mr. Yarrell, from the caverns at Colchester; and one we had living

was sent from the chalk cavern at Chiselhurst in Kent, and the illustrations which accompanied the description in the first edition, taken from this specimen, were, we believe, the first which appeared of this species. It has, however, since that time been figured both by M. Temminck and by Prof. Blasius.

The Whiskered Bat, although not rare in this country, is seldom seen in any numbers, which is due in great measure to its solitary habits. It may, indeed, be sometimes seen in sufficient abundance to lead to the belief that it is somewhat gregarious, but it will be found, on further examination, that it is supply of food, or shelter, which brings them together, rather than desire for each other's company. Its flight resembles pretty closely that of the *Pipistrelle*, and it frequents nearly the same situations, but we have often noticed a slight difference, viz., that while the present species prefers the sheltered side of a high hedge to any other place, the *Pipistrelle* will rather choose as its hunting-ground a quiet corner between trees or buildings. However, it would be difficult to distinguish the two species by their choice of nocturnal haunts; and their places of repose are even more alike. In all sorts of hiding-places the Whiskered Bat may be found during the day, and generally singly. Holes in walls, roofs of houses and other buildings, or the spaces behind shutters or sign-boards, will serve very well for a resting-place during its hours of repose, and it does not refuse a convenient hole or crevice in a tree, nor even an auger-hole in an old unused gate-post, which situation we have known one occupy for some time. It is also a frequenter of caverns, as already mentioned, at Colchester and Chiselhurst; and we have known it taken from others excavated for the purpose of obtaining gypsum, on the estate of Sir R. Throckmorton,

at Spornal Park, in Warwickshire. It is not very unusual to see this Bat abroad during the day, even in bright sunlight. One observed about noon on the 16th of April, 1852, at the village of Welford, about a mile from the abode of one of the authors of the present work, when captured, was found to answer admirably to the description of the *Vespertilio humeralis* of M. Baillon. As in that so-called species, there was a *well-defined* pure black spot at the insertion of the humerus.

The Whiskered Bat brings forth one young one at a birth, about the end of June or in July; the exact time depending, in this species as in others, upon the forwardness of the spring, or, in other words, upon the period when they emerge from their winter's repose.

Hitherto we have not heard of the occurrence of the species in Scotland, and in Ireland it appears to have been observed but once. Its occurrence at Feakle, in the county of Clare, is recorded by Dr. Kinahan in the Proceedings of the Natural History Society of Dublin.*

To the country in which it was first discovered by Leisler, we may add, on the collective testimony of M. Hollandre, Baron De Selys Longchamps, Prof. Blasius, M. Nilsson, and Prof. Brandt, the following countries, viz.: France, Belgium, Switzerland, Sweden, and Russia; and we find it included in the recent work on the Mammals of the Amoor by Dr. Leopold von Schrenck.† Finally, we think that the Himalaya Mountains will have to be given as a habitat, as the *Vespertilio sili-gorensis* of Mr. Hodgson‡ appears to differ in no

* Vol. II.

† Reisen u. Forschungen im Amur-Lande in den Jahren, 1851-56. Bd. I. Säugethiere, 1858.

‡ Ann. Mag. Nat. Hist., August, 1855.

important respect, externally, from the *Vespertilio mystacinus*.

The head is of medium length, the forehead somewhat elevated, the occiput prominent; the muzzle is rather pointed, slightly emarginate between the nostrils, which are tumid, particularly at the upper and inner angle. Face very hairy, so much so as to give the short and thick appearance; the hairs on the lip longer than the others, forming a moustache; and there is a similar row across the forehead: the chin has also a few long and stiffish hairs. Ears shorter than the head, oblong, rounded at the upper part, bending outwards, broad at the base, rather deeply excavated at the outer margin; tragus rather more than half the length of the ears, lanceolate, strait, a little expanded on the outer margin near the base. Eyes small, and much concealed by the hairs. Tail longer than the fore-arm, the exerted portion about a line in length, curved. Fur long and thick; the hairs of the upper part of a dusky black colour, excepting at the extreme tips, which are shining rufous; beneath ash-grey at the tips, blackish near the roots. Ears and flying membrane dusky, very dark; the transverse lines of the wings very numerous, those of the interfemoral membrane being no fewer than eighteen. Old and pregnant females, or those having young ones, are often of a faded brown or rusty colour on the upper parts, the lower parts being dirty brownish white. This is the *Vesp. emarginatus* of Macgillivray, described in his work on British Quadrapeds. Young individuals are sometimes almost black.

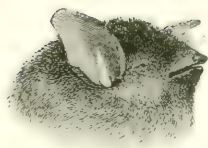
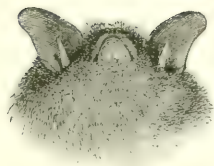
Dimensions :—

	Inch.	Lines.
Length of the head and body . . . . .	. 1	8
„ of the head . . . . .	. 0	7

	Inch.	Lines.
Length of the tail	1	5
,, of the ears	0	5½
Breadth of the ears	0	3½
Length of the tragus	0	3 nearly
,, of the fore-arm	1	3
Extent of the wings	8	6

Dentition :—

$$I. \frac{4}{6} : C. \frac{2}{2} : F. M. \frac{6}{6} : M. \frac{6}{6} = \frac{18}{20}.$$



CHEIROPTERA.

VESPERTILIONIDÆ.

Genus, *Plecotus*. (Geoff.)

Generic character.—Ears very large, much longer than the head, united at the base. Cutting teeth $\frac{4}{8}$, grinders $\frac{5.5}{8.6}$.

LONG-EARED BAT.

Plecotus auritus.

Ears more than twice the length of the head; tail longer than the forearm, rather obtuse at the apex: fur brownish grey above, paler beneath.

- Vespertilio minor*, BRISSON, Quad. 226.
 „ *auritus*, LINN. Syst. Nat. 47, sp. 5. GEOFF. Ann. Mus. VIII.
 p. 197. KÜHL, Deutsch. Flederm. sp. 1. DESMAR.
 Mammal. p. 114. JENYNS, Brit. Vert. p. 27, sp. 36.
Plecotus auritus, GEOFF. GRAY, Zool. Journ. II. p. 109. FLEM. Brit.
 An. p. 7. BONAP. Faun. Ital. p. 108.
 „ *Christii*, GRAY, Mag. Zool. Bot. II. 13.
 „ *homochrous*, HODGS. Journ. As. Soc. XVI. 894.
L'Orcillard, DAUBENT. Mém. Acad. 1759, p. 376, t. i. f. 2. BUFFON,
 Hist. Nat. VIII. p. 118, t. xvii. f. 1.
Long-eared Bat, PENN. Brit. Quad. I. p. 147, t. xiii.

THE comparative ignorance of the characters of the *Cheiroptera* which prevailed until Daubenton set the

example of a more attentive observation of them, can scarcely have a more striking illustration than the fact that the present species, although larger than many other European species, now well known and sufficiently distinguished, received from Brisson, who first characterized it, the name of *Vespertilio minor*, the comparative term *major* having been at first applied to *V. murinus*; and Linnæus, who altered the above specific names in the twelfth edition of his *Systema Naturæ*, has the following remarkable observation appended to the present species, *V. murinus* being the one following it. “Distincta species auriculis, nisi solo sexu cum sequenti conveniat.”

It is a common though not very abundant British Bat, is more readily tamed than most others, and may soon be brought to exhibit a considerable degree of familiarity with those who feed and caress it. We have frequently watched them when in confinement, and have observed them to be bold and familiar even from the first. They are very cleanly; not only cleaning themselves after feeding, and at other times, with great assiduity, but occasionally assisting each other in this office. They are very playful too, and their gambols are not the less amusing from their awkwardness. They run over and against each other, pretending to bite, but never harming their companions of the same species; though we have seen them exhibit a sad spirit of persecution to an unfortunate Barbastelle which was placed in the same cage with them. They may be readily brought to eat from the hand; and one kept by Mr. James Sowerby, when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly towards it, and, pitching on the hand, take the fly without hesitation. If the insect were held

between the lips, the Bat would then settle on its young patron's cheek, and take the fly with great gentleness from the mouth: and so far was this familiarity carried, that when either of the young people made a humming noise with the mouth, in imitation of an insect, the Bat would search about the lips for the promised dainty.

The ears are developed to such an extraordinary degree as at once to strike the most incurious observer, and yet probably their actual comparative magnitude is not fully recognized. Let us imagine a horse or a dog having ears as large as its own body, and grotesque and whimsical as the idea may seem, it is completely realized by the singular little animal of which we are now speaking. Yet we are not impressed with the least idea of awkwardness when inspecting it: on the contrary, its ears appear to be so completely under management, and are thrown, at the will of the animal, into such elegant curves and folds, and are themselves so exquisitely silky and transparent, as to render the species one of the most interesting of our native Bats. The use of these extraordinary and highly developed organs has not hitherto, we believe, been fairly recognized, but we may rest assured that Nature, ever prodigal in means, but not wasteful, has ordained them for the performance of some important office in the economy of the species. As we have in a former part of this work mentioned, M. de Jurine made some interesting but cruel experiments on the flight of Bats when deprived of sight; and we may now mention that the present species was one of those which supplied the materials for these experiments. When deprived of its eyes, this Bat continued to pass through narrow openings with great ease and address, but when the organs of hearing were also completely closed, the

animal struck itself against whatever came in its way. Our own observations have led us to believe that the Long-eared Bat, although often to be seen hawking in the evening with the Pipistrelle and other Bats, is nevertheless essentially a nocturnal species, coming abroad late in the evening, and continuing its flight through the whole of the night. Until accident had made us acquainted with its voice, when on the wing, we were unaware how often we had been unconsciously in its company. At all hours, through the dead of the night, and in the darkest nights, in the open fields, or elsewhere, we have heard the shrill chatter of the Long-eared Bat over our heads, its voice, once known, being easily recognized from that of any other species. May we not reasonably suppose, that the great development of the outer ear, with the corresponding development of its inner structure, may be the means whereby the creature is enabled to thread its way through intricate passages, when deprived of its eyes, and by which it is fitted to pursue its flight in the darkest nights, when we have failed to detect the presence of other species? The large and prominent eyes, however, doubtless assist it materially in its nocturnal wanderings.

The progression of this species on the ground differs considerably from that of all the species of true *Vespertilio*. Instead of running quickly along the ground in a horizontal posture with the head low, the fore parts are somewhat raised, and the body thrown forward by successive jerkings, given alternately on one side and the other. We have been led to suppose, from continued observation, that this posture of the body is more or less maintained during flight.

The large and beautiful ears are usually folded under the arm during sleep, especially if the sleep be profound:

and this is also the case during hibernation ; the long tragus then hangs down, and gives the animal the appearance of having short and slender ears.* Indeed, a person who had not seen it in the act of folding its ears, could never imagine it to be the same species when they are fully expanded. This circumstance refutes the notion suggested by Edwards and adopted by Pennant, that the “lesser ear may possibly serve as a valve to close the larger in the sleeping state of this animal.”

The cry of this species is acute and shrill, but not loud. It affords a rather remarkable illustration of the well-known fact, that some persons are incapable of detecting certain sounds ; as during the time that several of them were kept living, by the author of the former edition of this work, although their small sharp cry was distinctly audible to persons sitting much farther from them than himself, and though he bent his attention closely to them, listening with the greatest intentness, he could not detect the sound unless the ear was placed close to their cage, though it was uttered frequently. On being disturbed, the sound becomes more clear and piercing.

The Long-eared Bat appears to frequent open country more than many other species, but that it also frequents the same situations as the Pipistrelle and Whiskered Bat we have the testimony of many observers to show. The following observations, made at Welford Hill by one of the authors, seem to throw some additional light on its habits and manners. Having occasion to rise early—about three in the morning—on opening the window of his bedroom, a Bat of this species was seen actively engaged around the sprigs of a spindle tree which extended across the window. It was in bloom at the time, and was surrounded by a cloud of micro-lepidoptera, on

* See the figure at page 16.

which the Bat was feeding. As this took place scarcely four feet from the open window, it was easy to see the whole proceeding, and to determine with certainty the manner in which the food was taken. With scarcely an exception, the moths were picked from the leaves while resting there, only one or two being taken on the wing. While thus occupied, the Bat hovered much after the manner of the Kistrel, and the ears were bent outwards so much as to curl down the sides of the face, appearing more like two large check-pouches than ears, no part of these appearing of greater elevation than the crown of the head. This could be noted very accurately, as the creature several times hovered scarcely a yard from the face of the observer, at the open window, as if desirous of entering. This it afterwards did, and flying round the room a few times, again went to its feeding.

The retreat of the Long-eared Bat is more frequently the roofs of tiled houses in villages or towns, in which places they may be found in summer suspended in clusters from the timbers, and during the winter closely packed between the tiles or in holes of the timbers. The towers of churches also are a favourite resort, and we have taken occasional specimens in the belfry of Stratford Church, when in pursuit of the *Vespertilio Daubentonii*.

The geographical range of this species appears to be considerable. In Europe it is pretty generally known, and specimens of a species of *Plecotus* from the Himalaya Mountains differs in no external respects from the European one. An examination of the *Plecotus Christii* of Dr. Gray has satisfied us that it also is referable to the British species; this specimen from North Africa, and one we possess which came from the fifth cataract of the Nile, have the fur paler and more ashy in

colour, and the membranes lighter, than the European ones, which they otherwise resemble.

The head is flattened; the muzzle rather long and projecting, horizontal, and slightly emarginate; nostrils with prominent edges, the openings lateral, passing backwards and outwards into a small fossa. The ears are enormously large, oval-oblong, semi-transparent, and transversely plicated; the outer margin commences immediately behind the angle of the mouth, and the inner third of its breadth is supported by three extremely thin slender cartilages, the elasticity of which must tend to restore the ear to its erect position after being turned under the arm during sleep: these cartilages extend nearly the whole length of the ear, and the inner margin is bent back from the middle cartilage, forming a broad longitudinal fold, which is ciliated at its edge, as well as along the carina formed by its duplicature. About a line from its base is a small lobe projecting laterally, so that when the ears are erect the two lobes touch each other: this lobe is hairy, thicker and more opaque than the rest of the ear. Immediately beneath it the ears are united over the forehead, forming an angular notch at the point of their junction. Tragus elongate, lanceolate, rather obtuse, bending very slightly outwards, about two-fifths the length of the ear. Eyes lateral, conspicuous, placed about a line anterior to the inner angle of the base of the tragus. The body appears rather broad, from the fur extending much over the shoulders. Tail nearly as long as the head and body, and longer than the fore-arm; projecting about a line beyond the margin of the interfemoral membrane. Spur extending fully half way from the tarsus to the tail. Fur rather long, thick, soft, and silky; above, lightish brown with a reddish tinge, which is more conspicuous in young specimens, the

older ones being more grey; beneath, pale brownish grey; the hairs are all blackish at the base. Membranes dusky, with a rufous tinge. Transverse lines on the interfemoral about twelve.

Dimensions :—

	Inch.	Lines.
Length of the head and body	1	10
„ of the head	0	8
„ of the tail	1	8
„ of the ear	1	5
Breadth of the ear	0	9
Length of the tragus	0	7
„ of the fore-arm	1	5
Extent of the wings	10	0

Dentition :—

$$I. \frac{4}{6} : C. \frac{2}{2} : F. M. \frac{4}{6} : M. \frac{6}{8} = \frac{16}{20}.$$



The *Plecotus brevimanus* of Jenyns, of which a figure was given in the first edition of this work, is now universally admitted to be the young of the present species. We have now before us a specimen which was taken at Malvern, which in all respects answers to the description and figure of *Plecotus brevimanus*, and the shortness of the fingers, with the partially ossified state of their joints, suffi-

ciently attest its immaturity. This condition of the joints of the fingers is so well shown in the accompanying wood-cut—the one formerly inserted as *Plecotus brevimanus*—that we feel no hesitation in introducing it as the young of the Long-eared Bat.



CHEIROPTERA.

VESPERTILIONIDÆ.

Genus, *Barbastellus*.

Generic Characters.—Ears moderate, united at the base; a hollowed naked space on the upper surface of the muzzle, in which the nostrils are placed; grinders four above and four below on each side.

THE BARBASTELLE.

Barbastellus Daubentonii.

Vespertilio barbastellus, GM. SOWERBY, Brit. Miscell. t. v. MONTAGU in Linn. Trans. ix. p. 171. KÜHL, Deutsch. Flederm. sp. 10. DESMAR. Mammal. p. 145. PENN. Brit. Zool. i. p. 183. JENYNS, Brit. Vert. sp. 38.

La Barbastelle, DAUBENT. Mém. de l'Acad. 1759, p. 381, t. ii. f. 3. BUFFON, Hist. Nat. viii. p. 119, t. xix. f. 2. GEOFFROY, Ann. Des. Sc. viii. p. 196, sp. 6, t. xlv. xlviii.

Genus *Barbastellus*, GRAY, Zool. Journ. vol. ii.
Plecotus barbastellus, LESSON, Mam. FLEM. Brit. An. p. 7.
Barbastellus vulgaris, BONAP., Faun. Ital.
Synotus Barbastellus, BLAS. l. c. p. 43, f. 33, 34.

ALTHOUGH long known as a native of France and of some other parts of the Continent, it is only of later years that the Barbastelle has been discovered to inhabit

this country. It was first described by Daubenton in 1759, in the Memoirs of the Academy of Sciences, and subsequently by Buffon in his great work. Kuhl, notwithstanding the extent of his researches on the Bats of Germany, and his exertions to procure all that exist in that country, failed to obtain one of this species; but Desmarest states that it is found there, though very rarely. Its first detection as a native of Great Britain is due to Mr. Sowerby, who published an account of it with a figure in the "British Miscellany." His specimen was found in the powder-mills at Dartford in Kent. In the ninth volume of the Linnæan Transactions, Colonel Montagu mentions two places in Devonshire, Milton and Kingsbridge, in each of which a specimen was taken. Mr. Gray, indeed, in his enumeration of the Bats of Great Britain in the second volume of the "Zoological Journal," doubts the identity of Colonel Montagu's specimens with the *Barbastelle*, because the individual marked by Montagu *Barbastellus*, in the British Museum, is undoubtedly *Vespertilio mystacinus*. Montagu's description, however, is so full and so correct, that it appears impossible for him to have been mistaken in the specimens from which he drew it up. Having received, as recorded in the former edition of this work, by the kindness of Dr. Waring, a very healthy individual which remained alive for several weeks, the opportunity was afforded of giving a few slight notices of its habits, though, of course, only as modified by being in a state of confinement.

It was taken during a very hard frost, in the latter end of December, in a large chalk cavern at Chiselhurst in Kent, which is excavated at the bottom of a shaft seventy feet deep. In this cavern, during very severe frosts, several species of Bats are found to retreat; and on this

occasion, with the Barbastelle was received a specimen of *V. mystacinus*, three of *V. Nattereri*, and several of *Plecotus auritus*. These little prisoners, when brought into a warm room, soon began to exhibit signs of vivacity ; and the Barbastelle, with the others, fed readily on small bits of meat, and drank water. He was a timid animal, and did not evince the slightest disposition to become familiar ; he would take his food, however, with his companions, and was accustomed to rest with them in a cluster, at the top of the box in which they were placed. The Barbastelle certainly became torpid more readily than any of the others, and more completely so ; but when awake, evinced extreme restlessness, and was incessantly biting with great violence at the wires of his box. When suffered to fly about the room, he flew very low, and less actively than any other under similar circumstances ; and he was fond of lying before the fire on the hearth rug, where he appeared quite to luxuriate in the warmth. Whilst the Long eared Bats evinced much attachment to each other, and became very familiar with me, the Barbastelle remained sullen and apart ; until at length I found that he was an object of persecution on the part of his more active companions, one of whom I detected in the act of giving him a severe bite on the back of the neck. This occasioned his immediate removal to another box ; but this sharp discipline probably hastened his death, which took place about a week afterwards, though he continued to eat till the day before he died. The specimen was a male, and apparently adult.

The situation in which this specimen was found perfectly agrees with the observation of M. Geoffroy, who says, “ Je l’ai trouvé à de grandes profondeurs dans les souterrains de Charlemont.”

Daubenton's figure of the head of the Barbastelle is very correct; that of Geoffroy in the "Annales du Museum," is excessively bad.

Very little information was afforded by any author as to the animal's habits, until a comparatively recent period, with the exception of M. F. Cuvier, who related the history of one he had in confinement for a few days. It was retained as a species of *Vespertilio*, until M. Lesson placed it with the Long-eared Bat in the genus *Plecotus*. Dr. Gray constituted it a distinct genus under the name of *Barbastellus*, which was certainly objectionable, as removing from it the specific one which had been bestowed upon it by its first discoverer. As no specific name was given by Dr. Gray, the deficiency was supplied in the former edition of this work by adding to it the name of the distinguished naturalist by whose labours it was first made known. In Weigmar's "Archives" for 1839, Count Keyserling and Prof. Blasius, objecting to the name of *Barbastellus*, substituted for it that of *Synotus*, and the latter is in general use amongst German and Russian naturalists, while most English and French zoologists employ the former.

In Warwickshire the Barbastelle is not very rare, although by no means abundant. Whether observed in its place of repose during the day, or when taking its evening flight, it is of equally solitary habits.

If in a twilight stroll about midsummer a person finds himself in a close proximity with a Bat of somewhat thick and clumsy form, but of rather small size, whose flight is so desultory that it appears to be flapping lazily about, hither and thither, seemingly without purpose, and intruding so closely that the flutter of its wings may be heard, and even the cool air thrown by their movement felt upon the cheek, it may with almost cer-

tainty be recognized as the Barbastelle. Although there is no English Bat which resembles the Barbastelle in its mode of flight, yet in choice of situation there are several. Where the Whiskered Bat and Pipistrelle are seen, the Barbastelle may be seen also, but having been once observed, it will, probably, be useless to make search again at the same place. Equally uncertain is its diurnal retreat; most likely not the same place for long together, as we have found it in places where it could not have rested the day previously. A crevice in a wall or tree, the spaces between the rafters and tiles of a cowshed, the timber over a sawpit, the thatch of a shed in a brickyard, or behind a cottage window-shutter, are suitable places of repose for the Barbastelle, in all which situations we have met with it, and always alone.

Mr. Jenyns states that the Barbastelle has been obtained in Northamptonshire and Cambridgeshire, and its occurrence in Suffolk has been recorded in the "Zoologist" by our friend Professor Newton, and at Easton in Norfolk by J. H. Gurney, Esq., M.P. This individual was taken from behind the bark of a pollard willow, a notice of which appears in the fifth volume of the "Zoologist." In the first volume of the same useful periodical is a notice of its occurrence at Epping, by Mr. Doubleday. It appears, so far as we can ascertain, never to have been met with in the Northern parts of England or Scotland, and Dr. Kinahan does not record it in his account of the Bats of Ireland.

As already stated, it inhabits Germany; it is found also in France and Italy, and, according to Baron de Selys Longchamps, in Belgium, where, however, it is stated to be very rare. We find it included by M. Nilsson in his Scandinavian Fauna, by Prof. Brandt, in his work on the Mammals of Russia, and by M. Nord-

man in the Natural History of M. Demidoff's Travels in Southern Russia and the Crimea. In the latter work it is thus noticed: "Tres commun sur toute la côte méridionale de la Crimée."

We have examined specimens from Nepaul, which had all the characters of European ones, and we are much inclined to suspect that the *Vespertilio leucomelas* of Dr. Ruppell is no other than the Barbastelle.

In its affinities the Barbastelle appears to be more intimately allied to *Plecotus* and the Australian genus *Nyctophilus* than to any others; but even from these it is very distinct, constituting in fact a well-defined genus of its own. We have not had the opportunity of making a comparative examination of the American Long-eared Bats, which have been placed by some writers in the genus *Plecotus*, but may remark that in all the specimens we have seen, the face bears as much resemblance to that of *Barbastellus* as to *Plecotus*.

The aspect of this Bat is more remarkable than that of any other of our native species, with the exception of the two species of *Rhinolophus*. The muzzle is truncated, and a groove leads on each side upwards to the nostrils: these are placed in a hollow on the upper surface of the muzzle, which is naked, and extends back to the union of the ears. The cheeks are rather tumid, and covered with black hair, which forms a sort of moustache. The ears are about the length of the head, nearly as broad as they are long, and irregularly four-sided; the inner edges are turned back, forming a longitudinal groove just within the margin; the outer and superior angle prominent, rounded, and turned back; immediately beneath this, on the external margin, is a rather deep notch, from which five or six slight transverse folds extend about half way across the ear; the anterior and

inner angles unite immediately behind the muzzle. The tragus is more than half the length of the ear, of an irregular lanceolate or semicordate form, with a protuberance near the outer angle of its base; the terminal third is linear, and the apex rounded. The eyes are very small, placed close to the base of the auricle (not within it, as generally described), and almost concealed by the hair on the cheek. The wings are rather broad, the interfemoral membrane full, and furnished with about twelve transverse lines. The end of the tail is free from the membrane for the length of nearly one line.

The fur is long, soft and bicoloured. In general colour it is darker than that of any other British species, or indeed than that of any other European species. All the upper parts are brownish black, the points of the hairs being brownish white; towards and on the hinder parts of the back the hairs are tinged with brown. The under parts are similar in colour to the back, but the pale tips of the hairs are longer, and less distinct; on the pubal region the hairs are shorter, and wholly of a whitish-brown colour, as are also the fine hairs which grow on the membranes on each side of the body. The face and all of the cutaneous system dusky black.

The young, when nearly full grown, differ only in colour from the adult in having less of the whitish colour on the under parts.

We possess a remarkable and beautiful variety, taken at Alcester in Warwickshire, which has the fur of the under parts, from root to tip, strongly tinged with purplish red, or rose colour, which was very conspicuous when the animal was fresh, but faded considerably after it was preserved. We have seen a perfectly white specimen of this species, and another in which the head and

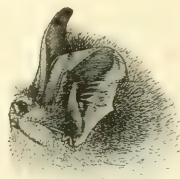
neck were of the ordinary dark colour, the remaining part of the body being pure white. In both these specimens the membranes were nearly white, and the imperfectly ossified condition of the joints of the fingers showed that they were young.

Dimensions :—

	Inch.	Lines.
Length of the head and body	2	0
„ of the tail	1	9½
„ of the head	0	7¼
„ of the ears	0	5¼
„ of the tragus	0	3¼
„ of the fore-arm	1	5
„ of the longest finger	2	9
„ of the fourth	1	10
„ of the tibia	0	8
„ of the foot and claws	0	3½
Expanse of wings	10	2

Dentition :—

$$I. \frac{1}{6} : C. \frac{2}{2} : F. M. \frac{4}{4} : M. \frac{6}{6} = \frac{16}{18}.$$



CHEIROPTERA.

RHINOLOPHIDÆ.

Genus, *Rhinolophus* (Geoff.)

Generic Character.—Incisors $\frac{3}{4}$; molars $\frac{4}{6}$. Nostrils with two foliaceous appendages; the posterior one erect and pointed posteriorly, the anterior one horse-shoe shaped, and expanded over the top of the nose. Ears lateral, free; tragus wanting. Wing membranes extending only to the distal extremity of the tibia; tail short, enclosed in the membrane.

GREATER HORSE-SHOE BAT.

Rhinolophus ferrum-equinum.

Specific Character.—Posterior nasal appendage lanceolate; the central or prominent parts of the facial crest with two anterior pits, divided vertically, behind which it is contracted laterally, from which it again expands, forming an ovoid space, which terminates posteriorly in a point. Anterior margin of the Horse-shoe smooth, and rather deeply cleft in its centre.

Vespertilio ferrum-equinum, LINN. GMEL. MONT. LIND. TRANS. ix. p. 122.

Rhinolophus unihastatus, GEOFF. ANN. MUS. IX. p. 257. DESM.
Mamm. p. 125. GRAY, Zool. Journ. ii.
109. TEMM. Mon. ii. 28.

Noctilio ferrum-equinum, KUHL, Deutsch. Flederm. p. 15.

Rhinolophus ferrum-equinum, LEACH, Zool. Miscell. iii. 2. FLEM. Brit.
Anim. p. 5. JENYNS, Brit. Vert. p. 19.
KEYS. et BLAS. Die Wirtel. Europ. p. xvi.
et 56. DE SELYS LONGCH. Faun. Belge,
p. 19. SCHINZ, Faun. Helvetica, i. 12.
BOSSAE, Faun. Ital. Tomo i. BRANDT,
Saug. Russl. p. 10.

THE whole of the singular family to which the present genus belongs, are distinguished by the existence of a cutaneous development upon the nose, which in some is simple, in others more or less complicated. In the genus *Rhinolophus* these nasal appendages are complicated, consisting of a posterior and anterior portion, the former of which is erect, hastate, or lanceolate, and placed at the base of the forehead; the latter shaped somewhat like a horse-shoe (from whence the various names which have been given to these Bats have been derived), bordering the upper lip, extending backwards to the posterior leaf, and enclosing the nostrils within its arch.

The use of this very remarkable structure it is perhaps difficult to explain. Geoffroy has suggested that it may be intended to close the nostrils when they are not required to be brought into use; and he instances some analogous modes of closing the orifices of other organs of sense. But when the extent and complication of these foliaceous structures are considered, and compared with the small simple orifice of the nostril, which could be more readily and effectually shut by a simple valvular thickening of one of its margins, there is so obvious a want of relation between the object and the means of effecting it, as to render such a supposition wholly untenable. It is more consistent with probability, however, when we consider that the Leaf-nosed or Large-eared Bats possess the singular power, to which we have before adverted, of threading their way through intricate places, without the assistance of eyes, to suppose that these singular membranous expansions may be in some way instrumental in the performance of these hitherto explained movements. That the simple-nosed species, having at the same time comparatively thick and leathery membranes, do not possess the power alluded to, we

fully believe. Mr. Blyth has remarked of *Vespertilio Nattereri*, that when flying round a room it struck a glass case with its wings; and we have seen the Noctule and Pipistrelle, when liberated from a box in a room, fly repeatedly against the glass of the window in their attempt to escape. A Horse-shoe Bat, on the contrary, when turned loose in the same room, and a Pipistrelle with it, avoided with perfect ease all sorts of objects, and the most careful examination we could make of its movements failed to detect so much as a touch of the wing, even when flying close to the glass of the window, which it appeared to be carefully examining, as if with the Pipistrelle it expected a means of escape which it failed to discover. When we consider that the glass would be equally visible or invisible to the one Bat as to the other, the experiment becomes interesting, as it tends to confirm those made by Spallanzani and M. de Jurine, with perhaps the difference that the faculty which they have ascribed to Bats generally, may be confined to such only as are possessed of a high degree of development of the cutaneous system.

A very remarkable peculiarity is said to appertain to the Bats of the family, which is the existence of a pair of supposed inguinal teats, in addition to the pectoral pair which belong to the whole order. They have been observed by numerous continental authors, and were also discovered by Montagu, when searching for certain parasites which infest these animals. Geoffroy is so certain of their being true mammary teats, that he at once goes into his favourite theory of analogies to account for and support this opinion; and certainly, if his statement be correct, this is not the most remarkable instance of a deviation from a similar rule, for, says he, “étant en 1827 à Marseilles, où m’y a fait connaître une femme qui

avoit également nourrit ses enfans par une mammelle supernuméraire inguinale!" Kuhl, however, who paid particular attention to the subject, declared that these supposed inguinal nipples in *Rhinolophus* were nothing more than cutaneous warts, without the slightest appearance of mammary glands beneath them.

The Great Horse-shoe Bat was added to the list of European *Cheiroptera* by Daubenton, and was first discovered as a British species by the venerable Dr. Latham, by whom it was communicated to Pennant, who published it in the fourth edition of his "British Zoology." Dr. Latham's specimen was taken in the saltpetre houses belonging to the Dartmouth powder-mills. It has since been found in many localities: in Bristol and Rochester Cathedrals, in caverns at Clifton, at Colchester, and we have seen examples from the Undercliff, Isle of Wight, and from Margate. It appears, however, never to have been observed in any of the Northern or even Midland counties, and is probably confined in its range to the Southern or Western parts of our island. Montagu found it in considerable numbers, in company with the Smaller Horse-shoe Bat, in the well-known cavern near Torquay, called Kent's Hole, a retreat so dark and gloomy, that no other species, even of this lucifugal family, were found to frequent it. The French naturalists equally record the retreat of this species to be chosen in the darkest and least accessible caverns, in abandoned quarries, and other subterraneous excavations.

Mr. James Salter has communicated to us in the following note another locality in which this species has been found:—

"I caught one of these Bats (*Rhinolophus ferrumequinum*) in the 'haunted room' at Tomson Manor House, Dorset, Sep. 29, 1865. It was flitting about the

room when I went to bed; the window had been left open. It measured the very large size of $14\frac{1}{2}$ inches in expanse of wing. On the next three nights, which were still and calm, I saw numbers of (apparently) the same Bats flying around the house among a grove of sycamores. The flight was low, short, and sluggish, both in the room and out of doors. I had no opportunity of securing a specimen from those outside the house, but I am quite satisfied they were the same. *Vespertilio Noctula* is the only other large Bat I have seen on Tomson Manor. I have often shot this species there in August, when they fly high with a bold extended range, quite different from the *R. Fr.*"

It is said to feed much upon chafers, of which it eats only the body.

It is probable that this species has a very considerable geographical range. In Europe it would appear to be pretty generally distributed, though we find that it is not included by M. Nilsson in his Scandinavian Fauna; by Prof. Brandt, however, it is mentioned as a Russian species. From Algeria we have seen a few specimens, which were received with numerous examples of *R. Euryale*, to which species the one under notice has probably, in respect of numbers, to give way. But it is more than probable that the Great Horse-shoe Bat occurs in many other localities in Africa, since we have examined and identified specimens from the Cape of Good Hope, which had been collected and transmitted to the Zoological Society by Sir Andrew Smith, and were included by Mr. Waterhouse in his Catalogue of the mammalia contained in the Museum under the name of *Rh. Capensis*.

The distinctions between this species and the following will be detailed in the account of the latter. They

are not very considerable, although very constant, nor, excepting in that of size, very obvious on a casual examination.

The head is long, the occiput large and rounded, the muzzle very tumid, and furnished with long stiff hairs. The mouth opens straight and wide; the upper incisors are extremely small, distant, and early deciduous; the inferior ones are broad at the crown and three-lobed. The anterior nasal leaf is horizontal, shaped like a horse-shoe, anteriorly emarginate, formed of three concentric elevations, the inner one thickened and forming the walls of the depression in which the nostrils are situated. Between the latter rises a prominent cup-like process, somewhat elongated posteriorly, its exposed surface being broadest anteriorly, and presenting a deep cup, which is divided equally by a vertical septum; about the middle this process is somewhat contracted laterally, but it again expands to nearly its former breadth, and terminates posteriorly in a short but rather acute point. The posterior or frontal leaf is as broad anteriorly as the Horse-shoe, but tapers up the forehead to a point, from which descends a mesial ridge, which divides before it reaches the cup-like process, each fork extending to the posterior end of the horse-shoe; from this ridge spring on either side two horizontal septa, thus dividing the leaf into six irregularly formed cells. The whole of this part of the facial crest is ciliated with stiff hairs. The ears are rather large, broad at their base, with the apices somewhat pointed, and turned a little outward; the outer margins produced along the sides of the face towards the corners of the mouth, and forming in the front of each auditory opening a kind of rounded lobe, which appears capable of closing the ear; from their outer margin extend about ten or twelve transverse

sulci, which reach to the middle of the ear. On their hinder surface is a little fine fur, mostly near to the inner margin; the cheeks and forehead are well clothed with soft fur; all the membranes are nearly free from hair.

Colour above, reddish grey; the fur paler at the root than at the tip; beneath, very pale grey, scarcely paler at the root than at the tip; membranes dusky brown, ears and facial crests pale brown.

Dimensions :—

	Inch.	Lines.
Length of the head and body	2	4
„ of the tail	1	4
„ of the head	0	11
„ of the ears	0	9
Breadth of the ears	0	6
Length of the fore-arm	2	0
„ of the longest finger	3	3
„ of the tibia	0	10½
„ of the foot and claws	0	5½
Expanse of wings	13	0

Dentition :—

$$I. \frac{2}{1} : C. \frac{2}{2} : F. M. \frac{4}{6} : M. \frac{6}{6} = 1\frac{1}{2}.$$



CHEIROPTERA.

RHINOLOPHIDÆ.



LESSER HORSE-SHOE BAT.

Rhinolophus hipposideros.

Specific character.—Posterior nasal appendage lanceolate, without lateral expansions at the base : ears deeply sinuous at the outer margins ; the transverse sulci obsolete.

- Vespertilio ferrum-equinum*, β , GMEL. LINN. 50.
 „ *minutus*, MONTAGU, Linn. Trans. ix. p. 163.
 „ *hipposideros*, BECHSTEIN.
Noctilio, NATURG. Deutsch. p. 1194.
Rhinolophus bilastatus, GEOFF. Ann. Mus. xx. p. 259, t. v. DESMAR.
 Mamm. p. 125, sp. 185. GRAY, Zool. Journ.
 ii. p. 109.
 „ *hipposideros*, LEACH, Zool. Misc. iii. p. 2, t. cxxi. FLEM.
 Brit. An. p. 5. JENYNS, Brit. Vert. p. 20.
 BLASIUS, Faun. Deutsch. i. p. 29.
 „ *hippocrepsis*, HERM. Observ. Zool. p. 18.
Petit Fer-à-Cheval, DAUBENT. BUFFON, Hist. Nat. viii. p. 131,
 t. xvii. f. 2.

THIS species was long considered as merely a variety of the Greater Horse-shoe Bat. Gmelin gives it as

such, quoting the two as the *V. Ferrum equinum major* and *minor* of Schreiber; and although Daubenton was well aware of the distinctions between them, there is nothing in his descriptions which can lead us to suppose that he had formed any more distinct opinion. Montagu appears not only to have been the first who discovered the Smaller Horse-shoe Bat to be an inhabitant of this country, but to have first ascertained that the characters in which they differ from each other are not those of mere varieties, but essentially specific; and he named the smaller one *Vespertilio minutus*—a name, however, which, for obvious reasons, could not be retained. Bechstein assigned to it a specific appellation, which, though not the best that might have been chosen, as being the mere translation into Greek of that of the former species, is now established, and has received the sanction of Leach and of all subsequent writers. Geoffroy's names of *unihastatus* and *bihastatus* are founded upon error, and, as well as that of *hippocrepis*, given to it by Herman, were also applied later than those which are here employed.

This species is found with the former, being similarly fond of the darkest and most concealed places of retirement. It was first taken by Montagu in Wiltshire, in a hollow over a baker's oven, having entered the place through a small fissure; and afterwards in a dark old shed surrounded by high trees, at Lackham, in the same county. He also obtained it with the former species in Kent's Hole, an extensive limestone cavern near Torquay in Devonshire, where it was observed in considerable numbers clinging to the vaulted roof of the interior apartments. Dr. Leach states that "it is a very cautious animal; very easily tamed, but fond of concealing itself. It frequents the higher parts of the caverns in

which it occurs, and probably flies higher than the preceding species."

It is not rare at Cirencester; and in Warwickshire it has been observed in at least two localities. A single example was taken by us in a loft over a smith's forge, in the village of Welford; and we found it on another occasion in considerable numbers in the roof of the mansion of the Marquis of Hertford, at Ragley, near Alcester. Amongst the massive timbers supporting the roof of this noble but now neglected residence, once the resort of royalty, are many pieces bearing evidences of former fittings by the augur and chisel, and in these holes a considerable number of the Long-eared Bat were found, chiefly in pairs, but although several of the Horse-shoe Bats were seen flitting in the deep gloom, broken only by an occasional gleam of light through some small crevice, and by our lighted candle, yet a careful search was for some time unrewarded by the discovery of a single individual in its resting-place. A great accumulation of excrement around a huge central stack of chimneys at length attracted attention, and a long stick, thrust upwards in a narrow opening between the chimneys, soon dislodged several of these Bats, which were caught as they descended, and before they were well on the wing, after which pursuit proved useless. Some of these examples being at various times liberated in a room, exhibited extraordinary powers of flight. One of them, turned loose with a *Pipistrelle*, as noticed in our history of the Greater Horse-shoe Bat, displayed in its search for a means of exit an ability which was quite extraordinary. It literally flew into every part of the room, and behind and under everything, even under a bookcase standing against a wall, although there was scarcely a space of three inches between it and the floor.

Some bookshelves in a recess especially attracted its attention, and after examining them diligently, it flew into a vacancy occasioned by the removal of a moderate octavo volume, and again into the open room, without having so much as touched anything with the tips of its wings. But it was most interesting to observe it when making an examination of the window, searching every pane over and over, inch by inch, until it might properly be said that no portion of the glass remained unexamined. While doing this, the wings were kept in a vibratory state, the face of the animal being directly in front of the glass, and very near to it, as if looking out of window. The general manners of the creature when thus engaged, conveyed in a slight degree the idea of a Hawk-moth, when hovering in front of a flower. From the behaviour of the individual, and its peculiar mode of flight, it was difficult to repress the idea that it was either *feeling* its way about, like a blind person, or *feeling* for an opening by which to escape; but, at the same time, its shyness when approached sufficiently testified that its organs of sight were by no means inactive. A considerable difference was observable in its manner of alighting from that of other Bats. Instead of adhering by means of its claws against an object, it invariably sought for something from which it could hang freely suspended. The leaf of a table which was let down was often tried, but its polished surface not furnishing a suitable hold for the claws, was as often relinquished for some fringe over a window, from which it would hang suspended by one foot for some time, swinging about, and twisting itself round, to watch those who were observing it.

The existence of this species in Ireland is now proved beyond a doubt, by the observations of several Naturalists in that part of the kingdom. It has been found in

Galway, by Professor King, and in considerable numbers in different parts of county Clare by Mr. Foot; and Prof. Kinahan has communicated an interesting account of this amongst other species now ascertained to be indigenous to Ireland, in the first part of his *Mammalogia Hibernica*.* He says that it appears to be the common Bat of that part of Clare in which it occurs.

Specimens which we have examined from various parts of Europe have presented no considerable degree of variation from British examples, but those from North Africa are usually somewhat paler in colour. A single specimen in the Paris Museum, which was collected at the Cape of Good Hope by M. Jules Verreaux, is, however, somewhat larger than any we have seen from this country, or indeed from any part of Europe.

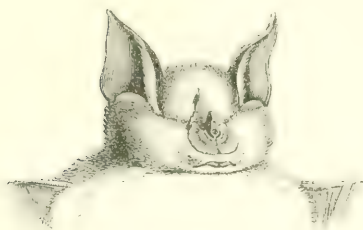
Its great resemblance to the former species renders it unnecessary to give a lengthened description of it. The nasal appendage is very similar in most of its parts; the erect process between the nostrils is much less cupped at the base, and the hood at the top is less prominent; the frontal leaf itself is lanceolate, and of greater relative size than in the *Ferrum-equinum*; and what may be called the outer margin of the horse-shoe, *i.e.* that part which lies upon the upper lip, is less closely applied, and has its extreme edge somewhat crenulated. The ears are rather more deeply sinuate on the outer margin, and the transverse sulci scarcely apparent—a peculiarity which is well preserved in Buffon's figure—and the lobe is larger in proportion. The muzzle is less tumid. The fur is equally soft and full; and the colours are very similar, the upper part being a little browner, and the under part rather more yellow.

* Taken from the Proceedings of the Natural History Society of Dublin, vol. ii.

Dimensions:—

	Inch.	Lines.
Length of the head and body	2	1
„ „ head	0	8
„ „ tail	0	11
„ „ ears	0	6
Breadth of the ears	0	5½
Length of the fore-arm	1	5
„ „ longest finger	2	2
„ „ thumb	0	3
„ „ fourth finger	1	11
„ „ tibia	0	7¼
„ „ foot and claws	0	4
Extent of the wings	9	0

The formula of the teeth is the same as in *Rhinolophus Ferrum-equinum*.



INSECTIVORA.

ERINACEADÆ.

Genus, *Erinaceus*. (Linn.)

Generic character.—Middle incisive teeth very long, standing forward; the upper ones cylindrical, apart; grinders $\overline{7}$: $\overline{7}$; anterior upper foremolars conical, the posterior one and true molars provided with angular cusps; posterior molar with only one cusp; molars of the lower jaw with angular cusps; body covered with spines; tail very short.

HEDGEHOG. URCHIN.

Erinaceus Europæus.

Specific character.—Ears less than half the length of the head; spines not longer than the head.

Echinus sive erinaceus terrestris, RAY, Syn. Anim. Quad. p. 231.

Erinaceus Europæus,

LINN. Syst. Nat. p. 75. DESMAR. Mammal.

p. 147. sp. 229. FLEM. Brit. An. p. 7.

JENYNS, Brit. Vert. p. 19. NILSS. Skand.

Faun. p. 92, 1847. BLAS. Saugt. Deutsch. p. 153.

.. *var. Amurensis*,

SCHRENCK, Reise. Amur—Lande, p. 100. t. iv. 1858.

Le Hérisson,

BUFFON, Hist. Nat. VIII. p. 28, t. vi.

Common Urchin,

PENN. Brit. Quad. I. p. 133.

Hedgehog,

SHAW, Gen. Zool. I. p. 542, t. cxxi.

DEPRIVED by its structure of all means of attacking its enemies, of defending itself by force, or of seeking safety in flight, this harmless animal is yet endowed with a safeguard more secure and effectual than the teeth and claws of the Wild Cat, or the fleetness of the Hare. Its close covering of sharp spines,—which are hard without brittleness, sufficiently elastic to bear great violence without breaking, and fixed with astonishing firmness in the tough leathery skin,—forms not only a solid shield to protect it from the effect of blows or falls, but a shirt of prickly mail sufficiently sharp and annoying to deter all but a few thoroughbred Dogs from venturing to attack it. Immediately that it is touched, or that it sees danger approaching, it rolls itself up into a compact round ball, by the contraction of the powerful muscles which cover the body immediately under the skin, and presents this impenetrable panoply, beset by innumerable spines standing out in every direction; the more it is irritated or alarmed, the more firmly it contracts, and the more strongly and stiffly the spines are set; and its appearance at such times did not escape the eye of Shakspeare, and was not forgotten when he put the following into the mouth of Caliban:—

“Then like hedgehogs which
Lie tumbling in my barefoot way, and mount
Their pricks at my foot-fall.”

The strength and elasticity of this covering is such, that we have repeatedly seen a domesticated Hedgehog run towards the precipitous wall of an area, and, without hesitation, without a moment's pause of preparation, throw itself off, and contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourteen feet: after a few moments it would unfold itself and run off unhurt.

The assertion of Pliny, followed by his numerous plagiarists, and amongst them by the greatest of all, Buffon, that the means of defence just described are aided by another of a very different character—the expulsion of its urine, namely, in such a manner that it spreads itself over the whole surface of the skin, and by its odour disgusts and repulses its assailants,—is wholly unsupported by later observation, and is doubtless a mere invention. Ælian, indeed, mentions the same fact, but with reference to a different object: “As soon as a Hedgehog is captured,” says he, “he sprinkles his body with urine, and renders useless a part which is in itself so useful;” alluding to the use made by the Romans of the prickly skin of the Hedgehog in hackling hemp for the weaving of cloth.

However effectual this defensive armour may be in most cases, it now and then happens that a well-trained and thoroughbred wire-haired Terrier is found hardy and bold and active enough to “open” a Hedgehog, at the expense of a bloody nose and sorely pricked paws. This, however, is rare; and it may be safely asserted that scarcely any animal is so admirably provided with means of self-preservation, which the absence of the usual methods of escape or of resistance render so necessary.*

The food of the Hedgehog is very various: it is, however, certain that it lives by preference upon animal food, though it will readily eat many vegetable substances. Its usual aliment is insects, particularly beetles, worms,

* I beg to refer the reader to Ælian, lib. vi. cap. lxiv. for a curious story of the method which the Fox is said to employ to force the Hedgehog to open. Our English Foxes appear, as far as we can ascertain, to have no particular liking for the Hedgehog while alive, but there is good reason for believing that they will feed readily upon these animals when dead, and even when quite putrid.

slugs, and snails; but it goes higher in the scale of gastro-nomic enjoyment, devouring frogs, toads, mice, and even snakes. The mode in which it attacks the latter animals is given in a manner worthy of the good old historian of Selborne himself, in a communication by Mr. Broderip, in the first volume of the Zoological Journal. The experiment was made by Professor Buckland, and is thus detailed:—"Having occasion to suspect that Hedgehogs, occasionally at least, preyed on snakes, the professor procured a common snake, and also a Hedgehog, and put them into a box together. Whether or not the former recognized its enemy was not apparent; it did not dart from the Hedgehog, but kept creeping gently round the box; the Hedgehog was rolled up, and did not appear to see the snake. The professor then laid the Hedgehog on the snake, with that part of the ball where the head and tail meet downwards, and touching it. The snake proceeded to crawl; the Hedgehog started, opened slightly, and seeing what was under it, gave the snake a hard bite, and instantly rolled itself up again. It soon opened a second, and again a third time, repeating the bite; and by the third bite the back of the snake was broken. This done, the Hedgehog stood by the snake's side, and passed the whole body of the snake successively through its jaws, cracking it, and breaking the bones at intervals of half an inch or more; by which operation the snake was rendered motionless. The Hedgehog then placed itself at the tip of the snake's tail, and began to eat upwards, as one would eat a radish, without intermission, but slowly, till half the snake was devoured. The following morning the remaining half was also completely eaten up."

The fondness of the Hedgehog for insects occasions it to be kept in many houses in London for the purpose of

ridding the kitchens of the innumerable hosts of cockroaches by which they are infested,* and also renders it useful rather than noxious to the gardener and the farmer. Sir William Jardine, however, mentions their fondness for eggs, and states that they do considerable mischief by destroying game in the breeding season, and that they will even enter a hen-house, and turning the hen off her nest, proceed to devour the eggs.

This statement of their partiality for eggs is fully borne out by gamekeepers, who catch many Hedgehogs in steel traps baited with hens' eggs. We can from actual experience affirm this to be correct, and moreover, that traps baited with the entrails of rabbits, or indeed with any other animal matter, will take many Hedgehogs, as well as other vermin, for as vermin these creatures are generally regarded. But the Hedgehog is not wholly undeserving of the charge of attacking young game, as the following statement, for the accuracy of which we are ourselves responsible, will sufficiently illustrate. Hearing the cries of a young hare in a field of wheat near Welford-on-Avon, we hastened, gun in hand, to the spot. The wheat was about the height of the knee, and too thick to allow of a sight of what was going on without a very near approach, and as the presence of a Stoat or Weasel was suspected, a shot was directed to where the wheat was seen moving. Rushing to the spot, we found, instead of Stoat or Weasel, a Hedgehog and a Hare about the size of a Rat. As due allowance had not been made for the height of the wheat, it was found on examination that the whole of the charge had passed over both the creatures, and they were unhurt, excepting

* We have seen a Hedgehog in a London kitchen push its way beneath a piece of carpet in all directions, and heard it at intervals crushing up the cockroaches which it met with. In a short time it freed the place of these pests.

that the hinder extremities of the Hare were paralyzed, which more careful observation proved to have resulted from a bite across the loins, where the fur was wet with saliva. The Hedgehog had rolled itself up at the report of the gun, and was found lying a few inches only from its victim, which would doubtless have been speedily killed and devoured. This carnivorous propensity of the Hedgehog is strikingly shown by the following passage in a communication by Major Spicer to the Zoologist (vol. xvi.):—"A friend of mine was one day passing under a rookery, and was attracted by a young rook on the ground, having fallen from its nest before it could fly, which was making a great noise, squalling most lustily, and on reaching the spot he found that a Hedgehog had got hold of him, having seized him by the back, and was mouthing and worrying him, and would no doubt soon have finished him had not my friend rescued him and destroyed the Hedgehog."

We have also had frequent opportunities of confirming what we have already advanced respecting the habit of the Hedgehog of feeding upon worms and mollusca. Large earthworms are taken and eaten in the dewy summer evenings when out of their holes, the animal commencing at one end and turning the worm from side to side of the mouth. The operation is a slow one, and appears to be performed wholly by the molar teeth. Although snails would seem to be a very probable food, and have been already mentioned as such, it may not be uninteresting to state, that in examining the contents of the stomach, we have never detected evidences of the shells of the larger species, although numerous fragments of the minute and thin-shelled *Helices*, such as *Zonites* and *Vitrina*, have been present. The small slug, *Limar agrestis*, is a favourite morsel with the Hedgehog, and is

often scratched out and eaten in the summer months when concealed in the day in crevices, or amongst the roots of grass or other close herbage.

That the Hedgehog, therefore, is no less an animal-feeder in fact, than related to the insectivorous group by its zoological characters, is thus sufficiently proved; but, as in many other cases, it is not so exclusively restricted to one description of food, as to be at all inconvenienced when obliged by circumstances to resort to a different one. Thus it will not only feed readily on soaked bread or dressed vegetables when in a state of confinement, but in a more natural and free condition, it is said, when turning up the ground, probably in search of worms, to eat the roots of grass or other plants; and in a garden to eat the ripe fruit which falls from the trees. "The manner in which they eat the roots of the plantain in my garden," says White, "is very curious: with their upper mandible, which is much longer than their lower, they bore under the plant, and so eat the root off upwards, leaving the tuft of leaves untouched."

There is an ancient prejudice still prevailing amongst the common people throughout this country, that it sucks the cows during the night, thus disappointing the milkmaid of the expected repletion of her morning pail. This, however, is about as well-founded an accusation as that of Pliny, exaggerated as it is by Sperling, who assures us that it ascends trees, knocks off the apples and pears, and throwing itself down upon them that they may stick to its spines, trots off with the prize! Ælian gives us the same story, substituting figs for apples, and omitting the climbing power of the animal.*

* It is fair to state, that there occurs in the *Zoologist* for 1853, p. 4151, a circumstantial account of two Hedgehogs having been detected sucking a Cow, and retaining their hold with such tenacity, that they remained sus-

It is easily rendered familiar, and will soon partake, without fear, of the food of the other domestic pets, the Dog or Cat, eating at the same time with them, and from the same dish. A friend of ours has one which will unfold and lie on his knees before the fire, suffering him to rub the naked parts of the face, from which it appears to derive great pleasure.

In its natural state it is, properly speaking, nocturnal, remaining coiled up in its retreat during the day, and running about all the night in search of food; but it may be occasionally seen during the day searching for food, perhaps driven by the demands of its young to be abroad at an unusual hour. Its run is quick and shuffling, and, as it were, by starts, but is not continued to any considerable distance at once.

The hibernation of the Hedgehog is, perhaps, as complete as that of any animal inhabiting this country; and much more so than that of many of the *Rodentia*, which retire, indeed, to winter retreats, but awaken at intervals, to eat of their treasured hoard of nuts or grain, when called into temporary life by a day of unwonted mildness. The Hedgehog, on the contrary, lays up no store for the winter, but retires to its warm, soft nest of moss and leaves, and, rolling itself up into a compact ball, passes the dreary season in a state of dreamless slumber, undisturbed by the violence of the tempest, and only rendered still more profoundly torpid by the bitterest frost. Its usual retreats are in the hollows of trees which are decayed at the bottom of the trunk; underneath its base, where the earth has been washed away

pendent to the udder when she rose, until knocked off with a stick. The fact rests upon the evidence of an intelligent boy of 16, a servant of T. F. Buxton, Esq., of Leyton, in Essex. We confess, however, that we feel a little sceptical respecting the accuracy of this statement.

from under the huge naked roots ; in holes of rocks ; on a dry bank in the bottom of a hedge-row ; or under the brushwood in a coppice or wood. We have seen their nests often in the latter situation, and composed entirely of withered leaves, the inner ones being perforated by the creature's spines, so that when removed from the nest it was yet enveloped by leaves. Withered leaves appear to be the best material for the nest, and are generally chosen as they are singularly effective in keeping out the wet. We have always failed to discover the place at which the animal has entered this retreat, the entrance being most carefully closed behind it.

The female produces from two to four young ones early in the summer, though the difference in their size in the autumn, when they are often found by sporting dogs, would seem to point out a somewhat variable period of birth. At birth they are blind, and covered with nascent spines, which are white, soft, and flexible at first, but become hard in the course of a day or two. "At this age," says Gilbert White, "they have little hanging ears. . . . They can in part draw their skin down over their faces, but are not able to contract themselves into a ball." A fact observed also by Mr. Bennett, and recorded in his valuable edition of the History of Selborne. The nest is formed with considerable art ; and the roof, even where there is no other covering, is capable of throwing off the rain, and preserving the interior entirely dry. Buffon relates that he has repeatedly placed the mother with the young in a place of confinement ; but that, instead of suckling them, she invariably killed and devoured them, notwithstanding she was provided with plenty of food. The same naturalist has a sufficiently absurd story respecting the breeding of these animals, which, as well as many other fables, he has copied impli-

citly from the credulous Pliny, who, however, received it from no less an authority than Aristotle himself. By the eloquence of his diction, and his great popularity, Buffon has been the means of perpetuating this, with innumerable other errors. We refer the reader to Pliny's account,* and leave the matter with this simple caution, that the notion is as unfounded as it is ridiculous. The whole account of the *Hedgehog*, as given by the celebrated French naturalist above named, with the exception of a few facts which occurred within his own observation,—and they are very few,—is, in truth, little more than a mere translation of the statements of Ælian and Pliny, polished and ornamented indeed in style, but very little improved in correctness or extent of information.

The flesh of this animal is eaten in some parts of the Continent, and occasionally by the rustics in the middle parts of England, and there are very contradictory accounts of its degree of excellence; some considering it excellent food, and others, on the contrary, declaring it to be ill-flavoured and rank. We have seen a roasted Hedgehog, and observed that the fat retained the consistency of oil, even when cold.

The voice of the Hedgehog is not often heard, but it is an odd sort of sound between a grunt and a low piping squeak; and Shakspeare, who has shown us by more than one allusion how much he knew of the habits of so obscure a creature as the Mole, has given us proof that he, too, was well acquainted with the voice of the Hedgehog. We refer to the following in one of the witch scenes in *Macbeth*:—

“Thrice and once the Hedge-pig *whin'd*.”

There has existed in France, for a long period, an

* Plin. Hist. Nat. lib. VIII. c. xxxvii.

opinion that there are two species of Hedgehog indigenous to that country, one of which is said to have the snout of a Hog, the other the muzzle of a Dog. Per-rault, who has given the only existing figure of the latter form, appears to have held this opinion, and to have supported it, at least to his own satisfaction, by dissections. Ray declares that one of them certainly does not exist in England, and seems to doubt its reality. Daubenton also states that he examined two males, said by the country people to belong to the two sorts above named ; and that, although he found considerable diversity in the dimensions of the various parts, as well as in the size and weight of the individuals, he comes to the conclusion that these distinctions constitute them varieties only of the same species.

The Hedgehog in Scotland appears to be confined to the middle and southern parts, and to be absent in the islands. It is generally distributed in Europe, and a variety, called by Dr. Schrenck *Amurensis*, has been met with by him in the vicinity of the Amoor river.

The body of this animal is oblong, regularly convex above ; the head very conical ; the ears short, broad, and rounded ; the eyes prominent. The teeth are thirty-six in number. The central incisive teeth in the upper jaw are long and robust, separated to a great extent above, slightly approximating towards the points, at which part, however, they are still distant ; the second and third on each side are small, particularly the second, and conical, resembling false molars. There is a small space between the third incisor and the next tooth, where falls the suture of the maxillary and intermaxillary bones : this tooth, in the opinion of M. Frederic Cuvier, is a false

molar, though Desmarest and others consider it a canine,—a class of teeth which, according to the former celebrated zoologist, is absolutely wanting in this genus. It resembles a false molar in having two roots. There are three other false molars, the first two smaller than the former, and the last having somewhat the form of the true molars, but with the anterior outer cusp very large, somewhat like the *carnassial* tooth in the Carnivora. The first two true molars are large, nearly quadrate, and furnished with strong acute tubercles; the first of these is the largest; the last molar is a small tooth, placed obliquely, and having in some measure a cutting edge. In the lower jaw the central incisive teeth stand nearly forwards, and much resemble those of the upper jaw. The three following teeth are considered by M. Frederic Cuvier as false molars: if this be correct, there are but two incisive teeth in the lower jaw. The two anterior of these so-called false molars stand forwards, and are very similar to the lateral incisive teeth of the upper jaw; the third is also oblique, but more nearly approaches a perpendicular position. Following these anomalous small teeth, is a prominent tooth of greater size, and separated from them by an interval, nearly vertical in position, but oblique in form, and with two principal cusps, and an inner rudimentary one. There is nothing anomalous about either the form or position of this tooth; it is clearly the last pre-molar, and to it succeed the three true molars,—the first being the largest, with five well-marked cusps; the second smaller, with four sharp cusps, and an anterior rudimentary one; and the third altogether small, with one pointed inner posterior cusp, and two other rudimentary ones.

The neck is short. The whole body is covered above and at the sides with numerous sharp, hard, round spines,

attenuated at each extremity, about an inch in length, arranged as it were in groups, generally diverging in all directions, but capable of being arranged with some degree of regularity. Their colour is a dirty white, with a brown or blackish ring rather above the middle. Legs very low, so as to allow the belly nearly to touch the ground when the animal is running. Snout, forehead, sides of the head, sides, and under part of the tail, throat, breast, and legs, covered with hard brittle hair of a yellowish white colour.

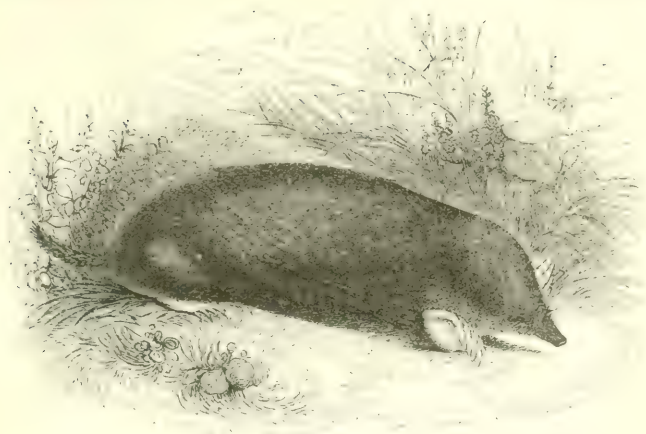
Dimensions, taken from a specimen which, its teeth being somewhat worn, is evidently adult :—

	Inch.	Lines.
Length of the head and body	10	0
„ „ head	3	0
„ „ tail	1	6
„ „ ears	0	8



INSECTIVORA.

TALPÆ.

Genus, *Talpa*. (Linn.)

MOLE.

Generic character.—Incisive teeth 2, equal, or nearly equal; canines large, triangular, compressed, with two roots; grinders $\frac{7}{5}$; body almost cylindrical, covered with short, fine, soft hair; fore-feet very broad, the palms turned outwards, formed for digging; tail short; no external ears; eyes extremely minute.

THE COMMON MOLE.

MOLDWARP (*Scotticè* MOUDIEWARP. WANT.*Talpa Europæa*.

Specific character.—Incisive teeth all equal; eyelids open.

Talpa Europæa, LINN. Syst. Nat. p. 73. DESMAR. Mammal. p. 169.
sp. 250. FLEM. Brit. An. p. 18. JENYNS. Brit. Vert.
p. 17. BONAP. Faun. Ital. BLAS. Saug. Deutsch. p. 109.

„ *culgaris*, BRISSON, Reg. An. p. 281, sp. 1. IS. G. St. HILAIRE.
Dict. Class. d'Hist. Nat. XVI. p. 70.

La Taupe, BUFFON, Hist. Nat. VIII. p. 81, t. xii.

Mole, PENNANT, Brit. Zool. I. p. 128. SHAW, Gen. Zool. I. p.
515, t. cxvi

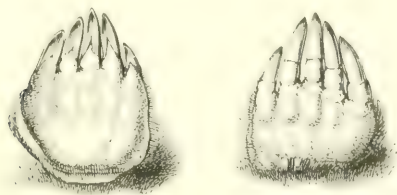
A SUPERFICIAL view of the form and habits of the Mole is but ill calculated to excite any desire to cultivate

a more intimate acquaintance with its history. Blind, awkward, and shapeless,—condemned to a life of incessant toil in subterranean darkness, its very existence only indicated by the ravages which it perpetrates in our fields and gardens,—the sole feeling which it excites in the mind of a casual observer is pity for the gloomy and laborious life to which it is subjected, or a determined hostility and desire for its extermination.

But if, on further investigation, this animal, apparently so helpless and miserable, be shown to possess as numerous and efficient means of happiness as any of the more obviously favoured species,—if, in addition to immense strength, undaunted courage, and indefatigable perseverance, we find that it evinces the skill of a consummate engineer, an unerring and varied instinct, and the most ardent conjugal attachment,—how different are the feelings with which we contemplate the former object of our contempt and pity. There is, however, another side to this picture. Interesting as its habits and instincts are to the naturalist, who sees in them only fresh proofs of the wisdom and beneficence of the Creator, which can render a life so apparently incompatible with comfort, in reality one of almost incessant enjoyment, the agriculturist looks with far different eyes upon the devastations committed in the different labours to which its varied instincts direct it, in the long subterranean galleries, the upheavings of the soil, and the superficial traces which it forms,—all of which he deprecates, whether deservedly or not, as so many causes of serious injury to the district which the intruder has chosen for its own domain.

The one prominent circumstance which strikes us on looking either at the habits or structure of the Mole, is that labour—hard and almost incessant labour—is its necessary doom. Its feeding and its habitation, its

wanderings and its repose, its winter retreat, and the nest in which its young are brought forth and nourished, are all so many calls for the most laborious and enduring toil; but, on the other hand, that toil is so amply provided for in the whole structure of the animal, so exactly balanced by the strength and conformation of its limbs, that it cannot be considered as exceeding the healthful and even pleasurable exercise of its natural powers. The general form of the body, which is nearly cylindrical, is calculated to facilitate its rapid progress through the subterranean passages which form its only routes of communication between the different parts of its domain; whilst its soft and silky fur, which, from its being inserted in the skin perpendicularly to its surface, will lie indifferently in any direction, offers no obstacle to its retrograde retreat when it meets with any opposition to its progress. The anterior extremities exhibit the most admirable conformation for the purpose of excavating its way through the soil. The strength and peculiar structure of the bones of the shoulder and of the fore-



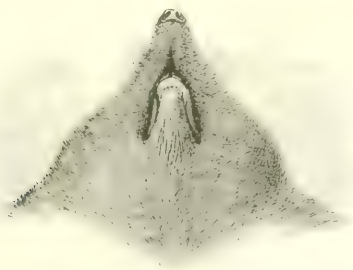
arm are in harmony with the remarkable form and direction of the hand. The joints of the fingers are extremely short, with the exception of the terminal ones, which are almost as long as the rest of the hand: these are

convex above, grooved beneath, taper at the extremities (at which part they approximate to each other), and each is furnished with a long acute nail, which is rendered strong by having the terminal phalange (which enters into and supports the nail) cleft longitudinally at its point. Into this furrow in the bone a corresponding rib of horn, on the inside of the nail, passes, thus making the nail of more than usual thickness and strength. The palms are directed outwards; the hand is only susceptible of being partially closed, which is effected by the inclination of the terminal joint alone. When thus bent, the hand is formed of two portions; the one consisting of the palm turned outwards, and the other formed of the terminal joint of the fingers, the direction of which is backwards,—a structure which at once explains the manner in which the earth and the smaller fibres of roots which are intermixed with it are, as it were, hoed away, and thrown directly backwards behind the animal. When at work, the tail is either carried erect or laid along the back.

But the Mole is not always employed in digging its weary and laborious way through the solid earth: it runs along its subterranean galleries and passages, and sometimes also on the surface of the ground, with considerable rapidity. This requires a very different construction of the feet from that which has been just described. It is, in fact, principally by means of the hinder feet, which are truly plantigrade, that the act of running or walking is effected. These are either placed under the belly or at the sides, as they press either against the inferior or lateral walls of the passage, and thus act as in other instances of plantigrade progression. The hands, however, are not without their use in this action, in which they are employed in their bent position, the extremities

of the fingers acting either on the floor or sides of the passages.

Another very important organ in the peculiar mode of life to which the Mole is subjected, is the elongated muzzle. This part projects considerably beyond the maxillary bones, and consists of the cartilages of the nose, perforated by the nostrils, which are perfectly



cylindrical tubes, elastic, flexible, and strengthened by a little bone at the extremity. This curious organ appears, from the observations of Geoffroy St. Hilaire, to be employed in two very different offices;—as a true organ of prehension, for seizing and bringing to the mouth its food and other matters; and as a boring instrument for perforating the earth, and thus acting in conjunction with the hands in the process of excavation. But whilst the external appendages to the organ of smell are thus beautifully developed for purposes remote from its primary object, the sense itself and its more immediate seat are found to occupy a very prominent place in the sentient organization of the animal. The sense of sight, so important to most others, would in the present case be useless, at least during by far the greater portion of its existence; and hence we find that it is reduced to its minimum of development, and sacrificed, as it were, to

the necessary pre-eminence of that of smelling. There can, indeed, be no doubt that to the latter sense the Mole is indebted for the perception of its food, of its enemies, and of its mate ; at the same time it appears to be much assisted by that of hearing, which, without the usual aids of an external conch, is certainly very acute. Shakspeare was not unmindful of this fact :

“Pray you, tread softly, that the blind Mole may not
Hear a foot-fall !”

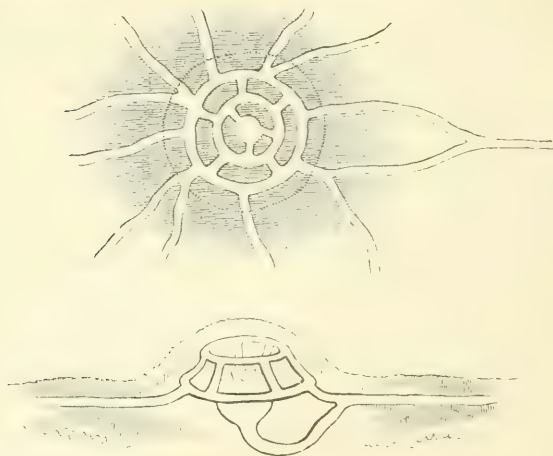
This is not perhaps the proper place to enter into an anatomical discussion to decide the long-contested and interesting question, whether the Mole possesses true vision or not. The actual existence of a visual organ, though in an imperfect state of development, is well known ; and the open condition of the eyelids, in the common species at least, would lead to the conclusion that this sense is not absolutely wanting to it. But the following experiment, instituted by Le Court, witnessed and recorded by Geoffroy St. Hilaire, appears to set the question at rest. It was made for the purpose of satisfying the doubts of this celebrated physiologist, and was conducted in the following manner :—A disused water-pipe or gutter was selected, in which were two openings, one forming the entrance, the other the exit. Into this tube several Moles were successively introduced, Le Court and his companion watching at the opposite opening. Whilst they remained perfectly motionless, the Mole quickly traversed the pipe and escaped ; but if, on making its appearance at the opening, a finger were but raised, it was sufficient to check its progress, and to occasion its precipitate retreat. This was repeatedly tried, and with the same invariable result.

But, it may be asked, if the Mole be really possessed of vision, how can we reconcile to this fact the decided

declaration of so acute and accurate an observer as Aristotle, that it is absolutely blind? It is not improbable that the solution of this difficulty rests in the existence, now well ascertained, of a second species of Mole, indigenous, like the present, to the south of Europe, the eyelids of which are totally closed, whilst those of the common one are so far separated as to allow the entrance of light; and it may be supposed that the former was the one which usually fell under the observation of that extraordinary man. To this second species I shall have occasion to revert.

The organization which I have thus slightly sketched is destined to the fulfilment of instincts the most interesting and curious. Every one is aware of the fact that the Mole burrows for its food, that its nest is formed under ground, that a larger hillock than the rest is raised for the reception of its young; but it is not so generally known that its subterranean excavations are of the most distinct and determinate character—that there are permanent passages or high roads for its ordinary travels from one part of its domain to another; that into these roads open the excavations in which it follows its daily labour in search of food; that its fortress—the house in which it resides from the autumn to the spring—is a complex and most ingenious structure, and that this domicile is always a distinct and even remote building from that in which the nest is formed. For these and many other interesting particulars in the life and habits of the Mole, we are principally indebted to the researches of Henri le Court, a person who, having held a lucrative situation about the court at the epoch of the French revolution, retired from the horrors of that fearful period into the country, and there devoted the remainder of his life to the study of the habits of the Mole, and of the most efficient means

for its extirpation. His discoveries have been recorded by M. Cadet de Vaux, in a work published in the year 1803, and more briefly by Geoffroy St. Hilaire, in his "*Cours d'Histoire Naturelle des Mammifères.*" This distinguished naturalist indeed visited Le Court for the purpose of ascertaining the truth and extent of these discoveries, and of enjoying the facility with which he was enabled by long habit to trace and to demonstrate the various labours of this object of his incessant research.



The district or domain to which an individual Mole confines himself may be termed its encampment. Within its limits, or at least in immediate communication with this district, all the labours of the animal are pursued. It consists of the habitation or fortress, from which extends the high road by which the animal reaches the opposite extremity of the encampment, and of various galleries or excavations opening into this road, which it is continually

extending in search of food, and which constitute, in fact, its hunting-ground. The fortress is formed under a large hillock, which is always raised in a situation of safety and protection; either under a bank, against the foundation of a wall, at the root of a tree, or in some similar locality. The earth, of which the dome covering this curious habitation is composed, is rendered exceedingly strong and solid, by being pressed and beaten by the Mole in forming it. It contains a circular gallery within the base, which communicates with a smaller one above by five nearly equidistant passages; and the domicile or chamber is placed within the lower and beneath the upper circular gallery, to which last it has access by three similar passages. From the chamber extends another road, the direction of which is at first downwards for several inches; it then rises again to open into the high road of the encampment. From the external circular gallery open about nine other passages, the orifices of which are never formed opposite to those which connect the outer with the inner and upper gallery: these extend to a greater or less distance, and, according to De Vaux, return, each taking an irregular semicircular route, and opening into the high road at various distances from the fortress. Such is a very hasty description of this most singular structure; and nothing surely can be imagined more admirably calculated to ensure the security or the retreat of the inhabitant, than such an arrangement of internal routes of communication as this. The chamber communicating beneath directly with the road, and above with the upper gallery,—this with the lower by five passages, and the latter again with the road by no less than nine,—exhibit altogether a complication of architecture which may rival the more celebrated erections of the Beaver.

Another very important part of the encampment is the high road, which has been termed by the Continental naturalists "the passage"—a name which affords no distinctive idea of its nature or use. It differs essentially from all the other routes and excavations, both in its construction and use. It extends from the fortress to the extremity of the domain in nearly a direct line, forming in fact the main route of communication between the fortress and the different parts of the encampment; and the alleys which lead to the hunting-ground, or quarries, open into it on each side. Its circumference is larger than the body of the Mole, though not large enough to admit of two individuals passing each other. The walls are beaten by the frequent pressure of the animal's sides against them, until they become very smooth and compact: in fact, this road is principally formed by the compression of the earth which surrounds it, rather than by actual excavation; and hence the infrequency of mole-hills over it, compared with the number which are observed in connection with the alleys and the quarries, in forming which the earth is removed out of the way by being thrown up on the surface. In some instances the same Mole forms a second and even a third road; but this is generally done in order to extend its operations to a new and more productive district. In other cases, many Moles are known to employ one road, though they never intrude upon each other's hunting-ground: in this case, should two of them meet, one must retreat into the nearest alley, or a battle ensues, which proves fatal to the weaker of the combatants. The road is formed at a greater or less depth from the surface, according to the nature of the soil, the danger of injury from superincumbent pressure, and other circumstances.

Thus, in safe situations, where there is nothing to disturb or threaten the security of its roof, it will be found at a depth of about four or five inches; whilst in other places, as under a road or beneath a stream, the earth is left not less than a foot or a foot and a half deep above it.

As it is only by the high road that the Mole can visit the different quarries or hunting-grounds of its domain, it is traversed regularly several times in the course of the day; hence it is only in this route that it can with any certainty be taken, and the traps are therefore always placed in its course by skilful Mole-catchers, so as to intercept the animal in its journey between the fortress and that alley which may happen at the time to be the seat of its labours.

The swiftness with which the Mole will traverse its domain by means of this principal road, was made the subject of an amusing and satisfactory experiment by Le Court. Having ascertained the exact direction of the road, and finding that the Mole was engaged in exploring for its food the ground at the farthest extremity from the fortress, he placed along its course, at certain distances, several pieces of straw, one extremity of which penetrated within the passage, and to the other end was fixed a little flag of paper. He also introduced into the passage near the end a horn, with the mouth-piece standing out of the ground. Then waiting till he was sure of the Mole's presence at that part of the road, he blew into the horn, to use the words of Geoffroy, "un cri effroyable;" when, in a moment, the little flags were successively thrown off, as the Mole, in its rapid course towards its fortress, came in contact with the interior extremities of the straws; and the spectators of this neat and demonstrative experiment affirm that

the speed of the frightened Mole was equal to that of a horse at full trot.

The alleys or galleries are opened from the sides of the road, and generally incline a little downwards from their origin towards their termination. We have already stated that the Mole forms the alleys by the expulsion of the earth; whilst the passage, or high road, is formed principally by its consolidation. When an alley is opened, if a plentiful supply of food be found, the Mole proceeds to form various ramifications from its extremity, throwing up fresh molehills as it advances in its search after its prey; but if the situation prove but sterile, another alley is opened at a different part of the road. These excavations are more or less deep, according to the nature of the soil and the degree of humidity,—circumstances which regulate the situation in which the earth-worms most abound. In forming its runs, or excavating its quarries, it pushes the loosened earth before it till it arrives at the last-formed hillock or mole-hill; and when this becomes too distant, it makes its way to the surface through the solid earth, forming a new shaft, over which another hillock is gradually made by the successive portions of earth which are brought from the scene of its mining operations.

But the labours of the Mole are not confined to the excavations already mentioned. In lands newly sown in summer with barley or turnips, the surface of which is consequently light and yielding, after moderate rain, which has brought the earth-worms to the surface, the Mole follows them, and pursues its chase along the superficial layer of the soil, digging a shallow continuous trench, in which work it advances with great rapidity. This is done by merely forcing its way through the light soil, and thus lifting it up; and Mole-catchers take

advantage of these times to steal softly upon them, and throw them out of the ground with their paddle. But great quickness is necessary in doing this, for the Mole will bury itself again so rapidly as often to escape, even when fairly thrown on to the surface. We have on more than one occasion seen a Mole making so shallow a run, that the fine soil has fallen away on each side, leaving the creature's back exposed to view. It is said that the gravid female, to whom the usual excavations in the subterranean alleys would be too laborious, limits herself principally to this lighter toil.

This description of the different methods in which the animal seeks its food, leads to the consideration of the nature of the food itself. It has been asserted, even by Le Court, as well as by many other writers, that it consists not only of earth-worms, insects, and other animal matters, but, in a considerable degree, of many vegetable substances,—particularly of the roots of the artichoke, of turnips, potatoes, carrots, and the young tender fibres of the roots of trees. The truth, however, appears to be, that it is exclusively, or nearly so, an animal feeder. The experiments of M. Flourens, as recorded by Geoffroy St. Hilaire, are conclusive on this point; and their results are too interesting to be omitted here. It must be premised that the appetites of the Mole, of whatever kind, are extreme in their degree. The Mole, says the latter distinguished naturalist, does not exhibit the appetite of hunger as we find it in other animals; it amounts in it to a degree of frenzy. The animal, when under its influence, is violently agitated: it throws itself on its prey as if maddened with rage; its gluttony disorders all its faculties, and nothing seems to stand in the way of its intense voracity. This picture certainly exhibits none of the characters of a vegetable, or even

of a mixed feeder; and M. Flourens accordingly found that Moles perished with hunger when supplied with a quantity of various vegetable substances, such as carrots, turnips, and different kinds of herbs. It is true that vegetable matters are occasionally found in the stomach; but this no more proves them to be vegetable feeders than the accidental reception into the stomach of some particles of sawdust by a captive Lion, who has had his food thrown to him on a floor covered by that substance, would indicate that the Lion is a feeder on sawdust. The cases are exactly parallel. The Moles gnaw the roots of plants for the purpose of extracting from them such larvæ and worms as feed upon them; they likewise seize upon earth-worms which are entwined amongst the masses of fibrous roots and earth which constitute the superficial layer of grass-lands; and in each case portions of the roots and of the soil itself would be swallowed with its actual food.

The principal object of its search, however, is the earth-worm. In pursuit of this its favourite food, it occasionally follows it towards the surface with such eagerness, that it actually throws itself out of its burrow upon the ground. It has been stated that the Mole will not eat the larvæ of the *scarabæidæ*, and other coleopterous insects that live under the ground; but this is certainly a mistake, as these larvæ have been found in their stomach. It is not, however, to these and similar kinds of food that the Mole is necessarily restricted: a mouse or a bird, a lizard or a frog, if placed within its reach, becomes a speedy victim to its voracity. Toads, however, it rejects, even when famishing with hunger; probably on account of the acrid secretion of the skin, first noticed by Dr. Davy. Geoffroy gives a curious picture of the manner in which it will approach, seize,

and devour a small bird ; exhibiting, in the first place, a considerable exercise of stratagem to get within reach of its victim, and changing on an instant this mode of approach for the most sudden and impetuous attack ; seizing the hapless bird by the belly, tearing it open, and thrusting its muzzle amongst the entrails, where it appears to luxuriate on its bloody repast. Even the weaker of its own species, under particular circumstances, are not exempted from this promiscuous ferocity ; for if two Moles be placed together in a box, without a very plentiful supply of food, the weaker certainly falls a prey to the stronger. No thoroughbred Bulldog keeps a firmer hold of the object of its attack than the Mole. Mr. Jackson, a very intelligent mole-catcher, says that, when a boy, his hand was so severely and firmly laid hold of by one, that he was obliged to use his teeth in order to loosen its hold.

It is not only in the warm and temperate seasons of the year, when the food of the Mole is of comparatively easy access and exists in great plenty, that its labours are steadily and regularly followed ; in the winter, when the frost has penetrated deeply into the soil, and the ordinary hunting-grounds are rendered useless and impracticable, it descends to a considerable depth by a perpendicular shaft, till it arrives at the part to which the earth-worms have been driven by the cold. Here its labours must be even more toilsome and less productive than ordinary ; but the voracity of this indefatigable gourmand must still be appeased ; and as it lays up no store for the winter, and cannot fast with impunity for more than a few hours, it may well be imagined how incessantly and laboriously it must work in such a season, and at so great a depth, to obtain a sufficient supply of worms to satisfy its insatiable craving. This rage of

hunger alternates with the most profound repose, which the animal enjoys either within its fortress, during the season in which that domicile is occupied, or in a simple mole-hill, devoted to this purpose, during the summer. Its bed is formed of various vegetable matters, such as grass, leaves, or similar soft substances. It sleeps for about four or six hours at a time in warm weather, and principally during the day; its usual working time being very early in the morning and at night.

In the spring, the Mole leaves the fortress, and does not return to this shelter until the autumn, when it does not generally re-occupy the same edifice, but constructs another; leaving the old one to the occupation of the Field Mouse, or other small animal of similar habits. During the month of June, or longer, it is in the habit of leaving its runs, and wandering during great part of the night on the surface of the land, in search of its food. Our late lamented friend Mr. Yarrell mentions having now and then, when shooting, surprised a Mole above ground, which his pointers have stood at as if it were fair game.

In addition to all the accomplishments and arts which we have assigned to our Mole, it possesses that of being an expert swimmer; an action for which the structure both of the hands and of the hinder feet are well adapted. Surprised in its encampment by the floods of autumn, it seeks its safety by this means; and a person residing at Waltham Abbey has assured us that he has seen Moles swimming very featly when the marshes of that neighbourhood have been inundated. But it is not only when driven to it as a means of escape from danger that it employs this mode of travelling: it will not hesitate to cross a brook, or even a broad river, in order to change its hunting-ground, or to emigrate from a district which

has ceased to yield it sufficient nourishment; and occasionally it would appear to take the water merely for the purpose of enjoying the luxury of a bath.

We have ourselves seen a Mole in the Warwickshire Avon evidently swimming about for its amusement, and apparently enjoying itself very much, although it appeared to be very careful not to go far from the bank, taking five or six short turns in the water, to and from its hole, which was even with the water's edge.

The Mole, like all other voracious animal-feeders, requires to drink frequently. Hence, where there is a colony of Moles using the same high road, a run is always made towards the nearest ditch or pond; and when this cannot conveniently be reached, we have Mr. Jackson's authority for stating, that the animal sinks deep perpendicular shafts, at the bottom of which water is always found, to which the Mole has easy access. Sometimes, according also to the observations of Mr. Jackson, these wells are full to the brim.

If, in the foregoing account of those habits of the Mole which have reference to the preservation of its individual existence, we have been struck with the ardour and perseverance of its character,—with the fierceness and voracity of its hunger, and the laborious and indefatigable toil employed to satisfy that appetite, it is found to exhibit equal violence in the ardour of the sexual passion, and equal pertinacity and boldness in its pursuit. The tracks by which the male pursues his mate are numerous and curiously divaricating; they are very superficial, and are made with great rapidity. They are termed by the French naturalists "*traces d'amour*;" and by our English Mole-catchers, "coupling runs," or "rutting angles." As the males are much more nume-

rous than the females, it often happens that several of the former sex are in pursuit of one of the latter ; in which case bloody, and even fatal, battles ensue between the rivals, which fight on the surface of the ground, and the victorious male is left in undisturbed possession. The attachment of the male to his mate would appear to be very powerful, though probably but short-lived. Le Court several times found a female taken in his trap, and the male lying dead close to her. Whether this may have occurred from starvation, the force of sexual attachment having been strong enough to overcome that of hunger, it is perhaps difficult to prove ; but when it is recollected how short a fast proves fatal to this animal, it is not perhaps an improbable explanation of this curious fact.

De Vaux seems inclined, in his antipathy to the Mole, to deny to it the possession of a single quality that bears the slightest analogy to any trait of character which we are accustomed to consider amiable or virtuous. If, however, we may believe the statement of one who declares himself to have been an eye-witness of the following fact, it is impossible not to accord to it the strongest conjugal and parental attachment. In the work so often quoted, is inserted a letter from a person who professes himself the advocate of this ill-fated animal, and who affirms that when a sudden flood reaches its nest, the male and female are seen braving in company the dangers which threaten them, and exposing their own lives to the utmost hazard in order to save their young ; in which office of affection they mutually assist and protect each other.

The nest is always distinct, and frequently remote from the fortress, and is usually, but not always, covered by a hillock ; which, when it exists, is much larger than

an ordinary mole-hill. It is formed simply by excavating and enlarging the point of intersection of three or four passages. The bed of the nest is composed of a mass of herbage, grass, roots, or leaves : in one which was examined by Geoffroy and Le Court, no less than two hundred and four blades of young wheat were counted. This, however, can scarcely be considered as an ordinary occurrence, as they generally prefer dry and soft substances. The choice of materials depends, in fact, upon the supply to be found near at hand. We have seen a nest dug out of the bottom of a whitethorn hedge, composed entirely of whitethorn leaves, and another in a coppice (a favourite place with the Mole for nesting), formed with dry fine grass, and leaves of such kind as appeared in plenty on the ground immediately over the nest. The period of gestation is supposed to be about two months or upwards ; and the young are brought forth in April,—sometimes earlier, at others later, according to the season : indeed young Moles have been found at all times from the beginning of April till August, which has led some persons to believe that there are more than one brood in the year. There are generally four or five, sometimes as few as three, rarely six ; and an instance is recorded in the eighth volume of Loudon's Magazine of Natural History, in which seven were found in one nest. The period of lactation is not accurately known, but is supposed to continue till the young are about half-grown. The prevalence of the number of males over that of females, and the occurrence of but a single brood in a year, are circumstances which tend greatly to circumscribe the increase of the species.

The Mole has always been the object of the most determined persecution on the part of the farmer and the

gardener, from the notion that it occasions a degree of injury, more or less sericus, to various products of the soil. This absolute proscription of a whole species can only be justified, if it can be justified at all, by the certainty that its devastations are so extensive as to inflict severe loss and damage upon mankind, in this his primeval and most important occupation; and it will not be an unreasonable or useless employment to endeavour to place the subject in its true light, and to ascertain as nearly as possible to what extent this character of an universal depredator is deserved. In order to arrive at a true solution of this question, it is necessary to divest our minds as well of the prepossessions of the naturalist as of the prejudices of the agriculturist; for we shall probably find, as in most other cases, that the truth lies between the two extremes. According to its accusers, there is no portion of its labours, no peculiarity of its habits, no function of its organization, that is not the means or the cause of ravage and devastation to our cultivated grounds. The soil, say they, is rendered dry and sterile by its subterranean roads; the crops are killed by the exposure or the destruction of the roots; the plants themselves are overthrown by the construction of the mole-hills, or they perish from their roots being eaten, or they are dug up and scattered by the superficial furrows which the animal ploughs up, either in search of food or in pursuit of its mate: large quantities of young corn, too, are carried off by it to form its nest; and, finally, its abandoned fortress becomes the resort of the Field Mouse and other noxious animals. Thus the field and the meadow, the garden and the plantation, are alike the scenes of its ravages; and De Vaux calculates that the loss which it occasions to the spring corn alone may be calculated at one-eighth of the whole produce. Then,

on the other hand, these prejudiced judges allow nothing for the benefit which arises from the destruction of innumerable worms, and of insects, both in the larva and perfect state: this advantage is in fact denied by De Vaux, who declares that the Mole feeds only on the most harmless of these animals, the earth-worm, and that it refuses those which are injurious to mankind. Its more benevolent advocates, on the other hand, contend not only that the injury which it perpetrates is slight, but that it is more than counterbalanced by the benefit which it produces by turning up and lightening the soil, and especially by its immense destruction of earth-worms, and many other noxious animals which inhabit the superficial layer of the ground, and occasion great injury to the roots of grass, corn, and many other plants. If we examine the real nature and degree of its injuries on the one side, and its utility on the other, we shall probably find that both parties are erroneous. The fact of its devastations cannot be denied—it is only in the degree and extent of them that the estimation is incorrect; and whilst its utility in clearing the ground of worms and similar causes of injury must also be allowed, it can scarcely be sustained that the lightening of the soil by the turning up of its hillocks is, at most, more than a very equivocal source of advantage.

Instances are not wanting of inundations produced by the burrowing of Moles through dams and dykes; but it would be too much to wage war with a whole race for an accidental transgression of this kind by a few individuals. Nor is it much to the purpose to urge the indirect injury which the Mole produces by forming habitations for different species of Field Mice, which often succeed to its deserted excavations. It is true that the new occupants are thus saved the labour of forming

their own retreats ; but this cannot materially influence their number, for it is only by the quantity of nourishment which they are able to procure that the increase of these little Malthusians is limited.

Be this as it may, however, the opinion is generally so strong against this active and unceasing labourer, that thousands are annually destroyed, and a considerable income is received by a good Mole-catcher in the course of a season, at a trifling sum given for each captured Mole. Mr. Jackson, to whom we have already alluded, and who appears to be a very intelligent person, and particularly successful in his business, states that he had been a Mole-catcher for thirty-five years, during which time he had destroyed from forty to fifty thousand of these animals. Mr. Couch, whose name is so well known as a zealous naturalist, and of whom such frequent mention is made by Mr. Yarrell, in his work on British Fishes, states that a Mole-catcher in Cornwall took no less than twelve hundred Moles in six winter months. But all others must yield to Le Court, who, in the short space of five months, took no less than six thousand Moles, within a comparatively small district ; and two of his pupils, during the month that they were under his instructions, killed nine hundred and seventy-one. It really seemed as if it were impossible that a Mole could escape this extraordinary person : wherever he struck his hoe, he found the Mole's run ; wherever he placed his trap, the Mole was surely taken. His trap was of a very simple construction. It consisted of a steel instrument of two branches, formed somewhat like a pair of sugar-tongs, excepting that the branches crossed each other about their mid-length ; so that the elasticity of the bend brought the extremities forcibly outwards and towards each other : the branches were held asunder by

a square piece of iron with a hole through it, which the slightest touch would displace; and the Mole, running along its passage, threw the trigger, as it may be called, and was caught by the branches springing sharply together. This appears to be a very simple, certain, and effectual instrument; but it is considerably improved upon in one now much employed in this country, in which the hinge, connecting the two branches, is placed in the middle, the spring behind, and the trigger before the hinge. A sort of box-trap has been recommended in some places; but it has the defect of being less certain, and at the same time it is not free from the objection of cruelty; as the Moles are taken alive, and when several are confined in the trap together, they fight in the most desperate manner, wounding and even destroying each other. In the middle parts of England a very effective and simple trap is made by sticking into the ground an ash or hard stick, three or four feet long, to the free end of which a loop of fine brass wire is attached, and the stick being bent down, the wire is made to pass through a hole in a small piece of board, into which a peg is introduced from below, to prevent the wire from being withdrawn by the elasticity of the stick. The board is so placed as to form a small portion of the roof of the run, and is firmly kept in position by sticks laid horizontally across it, which are pegged down at their ends by hooked pegs. The loop of wire passing through the board is opened below, so as to fit the inside of the run; and the peg, which keeps it from being drawn up by the spring-stick, projects downwards into the middle of the run. The Mole, passing along, pushes out the peg, whilst its own body is within the wire loop, which is instantly drawn up, and the creature is speedily killed.

The Mole is not found in the northern extremity of

Scotland, nor in the islands of Orkney and Zetland. It has never been seen in any part of Ireland, a circumstance which has been attempted to be accounted for, by some, by the nature of the climate and the soil. This, however, is not an equivalent cause; as it is found in every kind of soil throughout England and the Continent of Europe. The more probable solution is, that the Mole was not originally a native of Ireland, like some other of our common animals, as for instance, the Snake; and, like that reptile, is destitute of the means of migration.*

The ancients in general appear to have had but vague notions respecting the habits and structure of animals: from this charge the great father of natural science is in an astonishing degree exempt. It has, however, been adduced as an instance of erroneous and superficial observation, that Aristotle held the Mole to be absolutely blind. I have already suggested that this probably arose from his having principally examined the species now called *Talpa cæca*, in which the eyelids are closed, whilst in the common species they are open. There is likewise a distinction in the character of the incisive teeth, which in the Common Mole are all equal, whilst in the other the middle ones are longer than the others; and De Vaux states that there are also some slight differences in their habits and architecture. Both these species are exceedingly well figured by Prince Charles Lucian Buonaparte, in his beautiful *Iconografia della Fauna Italica*.

* The experiment of introducing a few Moles into some favourite locality in Ireland, and noting their increase, would determine how far the nature of the soil is concerned in their absence. We venture to predict, that if such an introduction ever takes place, that they will be found to thrive as well as in England.

There are several remarkable varieties of the present species: it is found of a deep black colour, of a mouse-grey, dark olive brown, pied, yellowish white, and wholly or partially orange. We have received from Switzerland (Berne) several examples of the usual dark colour, but having a well defined lozenge-shaped patch of orange on the breast. It has been supposed that some of these differences of colour are connected with soil or climate; but there appears to be but little ground for such an opinion.

The ancient English name of the Mole is Mouldwarp, or Mouldiwarp, from the Anglo-Saxon "Molde," soil; and "Weorpan," to throw or turn up. This is still its common name in many parts of England, particularly in the North. Gascoigne, who wrote in the sixteenth century, employs indifferently Mowle and Mouldiwarpe; Spenser uses Mouldwarp; and Shakspeare has Mole, as it is now spelt: thus, in the first edition of *Hamlet*, printed in 1603,—

"Well said old Mole, canst worke in the earth
So fast? a worthy pioner!"

In Dorsetshire, Devonshire, and other parts of the West of England, it is always called Want: a name probably introduced by the Danes; "Wand" being the old Danish, and "Vond" still the Norwegian name for this animal. In most of the Midland counties it is called a Hunt, or Hoont, which is probably the same as Want or Woont.

The body of the Mole is thick and full, oblong, nearly cylindrical, not ordinarily raised above the ground: head tapering to the extremity of the nose, which is formed for turning up the earth. The teeth sharp-pointed, the

incisives very small, the canines long and very acute;* the false molars like the canines, but much smaller; and the true molars broad, and having many sharp conical elevations. Eyes extremely small, black, situate in the middle of a circular naked space of about a line and a half or two lines in diameter: eyelids open to a very small extent. Ears without any external conch. Anterior feet very robust, formed for digging; the palms turned outwards, the fingers short, the terminal phalanx being as large as all the others; wrist concealed in the fur. Tail scaly, and furnished also with long stiff hairs. Fur very soft, silky, and short, inserted perpendicularly to the surface of the skin; shining like velvet, showing different tints according to the direction in which it is viewed; bright grey when seen in the direction in which the hairs lie, and rich deep black in the opposite one: a slight yellowish tinge appears on the lower jaw, and along the middle of the belly.

Dimensions :—

	Inch.	Lines
Length of the head and body	5	2
„ of the head	1	7
„ of the tail	1	2

Dentition :—

$$I. \frac{6}{8} : C. \frac{2}{2} : F. M. \frac{8}{8} : M. \frac{6}{6} = \frac{22}{22}.$$

* Assuming that the prominent double-rooted tooth is a canine, as stated in the first edition of this work. As a contrary opinion to this, although entertained by so great an authority as the late Prof. de Blainville, has not been supported by better evidence than the opinion advanced in this work in 1837, we shall adhere to the same formula of dentition as was employed at that time.

INSECTIVORA.

SORICIDÆ.

Genus, *Sorex*. (Linn.)

Generic Character.—Incisors $\frac{1}{2}$, upper ones curved, with a spur or pointed cusp behind; at their base, lower ones, horizontal in position, produced, with their upper edge denticulated; premolars $\frac{2}{2}$, upper ones decreasing in size from first to last, first lower one smaller than second; tips of all the teeth deeply stained with brown. Snout attenuated, fur short, soft, and silky; tail long; feet formed for running.

COMMON SHREW.

SHREW MOUSE.

Sorex vulgaris. (Linn.)

Specific Character.—Reddish mouse-colour above, paler beneath; tail somewhat quadrangular, rather shorter than the body, not ciliated beneath.

- Sorex vulgaris*, LINN. Mus. Adolph. Frid. 10, 1754. NATHUSIUS, Weigm. Archiv. I. 1833, 46. BLAS. Saugth. Deutsch. p. 129. NILSS. Skand. Faun. p. 75.
 „ *tetragonurus*, HERM. Obs. Zool. 48, 1780. JENYNS, Mag. Zool. Bot. II. p. 24, Ann. Nat. Hist. 1838, p. 417, Ann. Mag. Nat. Hist. 1841, v. 7, p. 261.
 „ *araneus*, BELL, Brit. Quad. p. 109. MACG. Brit. Quad. p. 123.

SINCE the publication of the first edition of the present work, much has been done, both in this country

and on the Continent, towards clearing up the synonymy of the European representatives of this difficult group of animals. The British species received the attention of the Rev. Leonard Jenyns as early as 1838, and in a series of papers, which merit our sincerest praise, he showed that the *Sorex araneus* of English naturalists was not identical with the *Sorex araneus* of French and German zoologists. He had before this time, in his work on British Vertebrate Animals, suggested the probability that such was the case; but it was not until the publication of his paper in the Magazine of Zoology and Botany that this became certain. In 1834, M. Duvernoy published an elaborate paper on Shrews in the Transactions of the Natural History Society of Strasbourg, the chief object of which was to make known that there were three distinct types of dentition among these animals, which were regarded by him as indicating three sub-genera. Mr. Jenyns, referring to this paper, was able to show that the Common Shrew of Great Britain possessed a type of dentition quite distinct from that of *Sorex araneus*, but was identical in that respect, and, indeed, in all these respects, with the *Sorex tetragonurus* of Herman, to which he referred it.

In his second paper, which appeared in the Annals of Natural History for the same year, 1838, Mr. Jenyns again reviews the British species, and confirms his former opinion respecting the identity of the so-called *Sorex araneus* of the country with the *Sorex tetragonurus* of Herman. He also in this paper points out an error into which he had fallen in his former one, *i.e.* of confounding a second and smaller British species with the *Sorex tetragonurus*, which he here regards as new, and describes under the name of *Sorex rusticus*. His third communication appeared in the Annals and Magazine of Natural

History for 1841, and to this we shall have occasion to refer in our account of the next species. But previously to the publication of this last paper, indeed bearing the same date as the first by Mr. Jenyns, and one year later than the date of publication of the first edition of the present work, a very excellent memoir on the European Shrews, by M. Nathusius, was commended in Weigman's Archives, in which the *Sorex tetragonurus* of Herman is given as a synonym of the *Sorex vulgaris* of Linnæus, and this decision is now generally accepted.

From their obscure and hiding habits, the Shrews are difficult of observation; their long and pointed snout, their extensible form, and short and velvety coat, enable them to pass through the closest herbage, or beneath the carpets of dry leaves in the coppice and woodland, in which situations, as well as in the open fields, whether cultivated or in pasture, they seek their food. But they are not confined in their habitat to such situations, as with their congeners, the Water Shrews, they are often met with in marshy and fen districts. The food is chiefly insects and worms, but also, as we have ascertained by personal examination, the smaller Mollusca are not refused. We have often found their runs in close herbage, around the foot of the trees in coppices, and not unfrequently these runs contain fragments of the shells of *Vitrina pellucida*, and some of the species of *Zonites*, and the remains of Coleoptera. That the Shrew feeds upon the Common Slug, *Limax agrestis*, is also certain, as we have taken the remains of this creature from its stomach, and, moreover, have fed it, when in confinement, with these Mollusks.

This animal, like the Mole, is excessively pugnacious, so that it is rare to see two of them together, excepting

in the act of fighting. If two Shrews be confined in a box together, a very short time elapses before the weaker is killed and partly devoured. They not only destroy each other, but there is reason to believe that many of them are victims to the voracity of the Mole. A friend at Waltham Abbey informed us, that in a field which had always before been abundantly inhabited by Shrews, scarcely one was seen during the season of 1837, but that a colony of Moles occupied the district, to whose voracity he, with much probability, attributed the disappearance of the Shrews.

It has often been stated that Owls, like Cats, will kill but not eat the Shrew; and this opinion has received some plausible support from the circumstance that Shrews are not uncommonly found dead, with the loins pinched, as if by the beak of some rapacious bird. The following fact, however, shows that this notion is altogether erroneous. Mr. Turner, of the Botanic Garden at Bury St. Edmunds,* on examining twenty pellets or casts of the Barn Owl, taken promiscuously from a mass of them, covering, to the depth of several inches, the floor of an ancient retreat of a pair of those birds, found amongst them the skeletons of no less than seven Shrews. We have ourselves seen several bushels of refuse taken from the inside of an old tree, which had been for many years the abode of the Barn Owl, and amongst the numerous small skulls which it contained, the most abundant appeared to be that of the present species. There appears to be more truth in the assertion of Pennant, and many other writers, that "Cats will kill, but not eat the Common Shrew;" and this aversion may probably arise from the rank musky smell which this species possesses,

* Loudon's Mag. Nat. Hist. vol. v. p. 727.

and which may also have been in some measure the cause of the ancient prejudice concerning its supposed power of inflicting injury by the mere contact of its body. Thus, in Edward Philips's "World of Words," it is stated that the Shrew Mouse is "a kind of Field Mouse of the bigness of a Rat and colour of a Weasel, very mischievous to cattel; which going over a beast's back, will make it lame in the chine; and the bite of it causes the beast to swell at the heart and die."

The superstitions of olden times are now fast fading from among us, like the ignited vapours of unwholesome bogs before the approach of day. The time can scarcely be far distant when even the existence of those which now remain will be matter of mere tradition, and offer many a subject of curious investigation to the antiquaries of succeeding ages; and many animals which, like the Shrew and the Hedgehog, are now the dread of the ignorant, and are destroyed from mistaken notions of their being directly or indirectly injurious to mankind, will be suffered to live on, and fulfil the beneficial offices which some of them at least confer upon us, by the destruction of creatures more noxious than themselves. The prejudices just alluded to, however, are still rife in many parts of the country; and the Shrew is yet believed to produce lameness by running over the foot, and disease to any part of an animal by the same means. The use of the ancient antidote to these imagined injuries has now probably passed away: it consisted in the application of a twig of a Shrew-ash, of the preparation of which Gilbert White gives the following amusing account:—

"At the south corner of the plestor, or area, near the church, there stood about twenty years ago, a very old grotesque hollow pollard-ash, which for ages had been

looked upon with no small veneration as a Shrew-ash. Now, a Shrew-ash is an ash whose twigs or branches, when applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a Shrew Mouse over the part affected; for it is supposed that a Shrew Mouse is of so baneful and deleterious a nature, that wherever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is afflicted with cruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which they were continually liable, our provident forefathers always kept a Shrew-ash at hand, which, when once medicated, would maintain its virtue for ever. A Shrew-ash was made thus: into the body of the tree a deep hole was bored with an auger, and a poor devoted Shrew Mouse was thrust in alive, and plugged in, no doubt with several quaint incantations long since forgotten."* Another method of cure was to make the person or animal pass through the arch of a bramble, both ends of which were rooted and growing.

The female Shrew brings forth in the spring from five to seven young ones. The nest, which consists of soft herbage, is made in any hole or depression on the ground, or in a bank: it is covered over at the top, and is entered at the side. The increase of the species which such a numerous progeny would be calculated to produce, is counterbalanced, not only by the destruction which takes place amongst them through the agency of other animals, --as Moles, Weasels, and Owls, but by a very general mortality which prevails early in autumn, the cause of which does not appear to be understood. So many may be found at that season lying dead in footways, or on other bare ground near their haunts, as to have led to the

* White's Selborne, pt. II. xxviii.

belief among country people that the Shrew could not cross a public way without incurring instant death. We confess ourselves wholly unable to furnish any explanation, having failed to discover any cause of death. Amongst the many we have ourselves picked up and examined, have been individuals of both sexes, and of all ages, as shown by the worn or unworn condition of the teeth, and the more or less naked state of the tail.

For the following etymological observations on the word Shrew, we are indebted to our late learned friend Mr. Thompson, of the London Institution:—

“*Scpeapa* (*Schreawa*, Angl. Sax.). ‘A Shrew Mouse; which by biting cattle it venometh them that they die.’—(Sommer.) Lye adds the orthography of *Schreova*. The etymon may possibly be found in *Schreadan*, to cut, or *Schrif*, to censure bitterly; or rather *Scheorfan*, to bite or gnaw (all Angl. Sax.), and the ordinary notion is that the biting disposition, expressed by the word Shrew, comes from the name of the Shrew Mouse; though Todd prefers deriving it from the German *Schreive*, to clamour, or from the Saxon *Schyrvan*, to beguile. In the word *Erdshrew* the prefix is clearly the Anglo-Saxon *Eorð*, *Eorth*, earth—designed to express the animal’s habitation.”

This species varies considerably in colours. It is usually of a reddish mouse-colour above, greyish beneath; but the brown of the upper part is more or less red in different individuals, in some approaching to black, in others to reddish brown, or chestnut, and we have seen one having all the upper parts cinnamon brown, with a strong tinge of ash colour, and the grey colour of the belly darker or lighter, and more or less tinged with yellow. Snout much attenuated; ears small, rounded, scarcely visible above the fur, with two internal lobes,

which are fringed with whitish hair; the anterior teeth of a rich brown colour. The body shortened, and the back elevated when at rest, but susceptible of considerable extension when running: tail always shorter than the body, though somewhat varying in proportional length; four-sided, with the angles rounded; of nearly equal size throughout, not attenuated at the extremity; furnished everywhere with short, close, rather stiff hairs, but not ciliated.

It sometimes occurs spotted with white; and we have a skin which is beautifully pied, having a broad white band over the loins, which extends all round the animal. This specimen was taken near Amesbury in Wiltshire. Individuals finely powdered with white are not rare, and have somewhat the colour and appearance of the hair of a roan horse.

Dimensions :—

	Inch.	Lines.
Length of the head and body	2	9
„ of the head	1	0
„ of the tail	1	7
„ of the ears	0	1 $\frac{3}{4}$
„ of the hind-foot and claws	0	6 $\frac{1}{2}$
„ of the fore-foot and claws	0	4
„ from end of nose to eye	0	5 $\frac{1}{2}$
„ from end of nose to angle of mouth, forming the gape-line	0	5



LESSER SHREW.

Sorex pygmæus (Pallas).

Specific Character.—Brown above, white beneath; tail usually longer than the head and body, well clad with hairs. The fifth pointed tooth in the upper jaw in the same line as the preceding ones, and distinctly visible externally. Length of head and body about two inches.

Sorex pygmæus, PALLAS, Zoogr. Rosso-Asiat., I., 134.
 „ *rusticus*, JENYNS, Ann. Nat. Hist., 1838, p. 417.

IN the “Magazine of Zoology and Botany” for 1837, the Rev. L. Jenyns described two varieties of *Sorex tetragonurus* (*S. vulgaris*), and in 1838, in the “Annals of Natural History,” he separated the smaller of these as a distinct species under the name of *S. rusticus*. At the same time he described an Irish specimen as possibly distinct, for which he proposed the name of *S. hibernicus*, but he was afterwards convinced that it was identical. In 1857, Prof. Blasius expressed his conviction that *S. rusticus* of Jenyns was identical with *S. pygmæus* of Pallas (“*Säugethiere Deutschlands*,” p. 153). By the kindness of our friend Prof. Newton, we have been able to examine one of Mr. Jenyns’ typical specimens, presented

by him to the Cambridge University Museum, and can fully confirm the accuracy of Blasius's identification.

The Lesser Shrew is distributed throughout the greater part of Europe, Northern Asia, and North Africa, but is nowhere so abundant as the last species. It appears to be generally distributed throughout England, Scotland, and Ireland.

In its habits it seems to agree with the Common Shrew. Blasius remarks that it is not so often seen abroad during the day, and it is subject to the same mysterious mortality in autumn.

The best characters to separate the Lesser from the Common Shrew are to be found in the teeth. In *S. vulgaris* the fifth single-pointed tooth in the upper jaw—regarded by Dr. E. Brandt as a minute canine—is extremely small, and is out of the line of the others, so as to be almost entirely invisible from the outside. In *S. pygmaeus*, on the other hand, these teeth diminish regularly in size, and the fifth stands in the same line with the rest, so as to be plainly discernible externally. In both species the front incisors have brown tips. In the Lesser Shrew the white of the lower parts is clearer, and the tail, which is longer in proportion, is more hairy at all ages, but it must be remarked that the last is a character in which the Common species is very variable.

With the exception of the *Sorex suaveolens* of Pallas, this is the smallest of European mammals; the average length of its head and body being about two inches, though some individuals are rather larger. The following are the measurements in inches and decimals of a Scotch specimen in our own collection:—

Length of the head and body	.	.	.	1.97 in.
„ of the tail	.	.	.	1.4 „
„ of the hind-foot	.	.	.	.4 „

INSECTIVORA.

SORICIDÆ.

Genus, *Crossopus*. (Wagl.)

Generic Character.—Incisors $\frac{1}{1}$, the upper ones curved, with a talon or pointed cusp behind, at the bases, lower ones with their upper edge nearly entire; pre-molars $\frac{4}{2}$; the first upper one larger than the two following, the fourth minute, first lower one smaller than the second. All the teeth more or less stained with rufous. Feet and under surface of the tail ciliated with stiff hairs.

WATER SHREW.

Sorex fodiens. (Pall.)

Specific Character.—Nearly black above, white beneath, generally with the colours distinctly separated; but sometimes the dark colour passing wholly or partially on to the under surface, which is also sometimes stained with rust-colour; tail two-thirds the length of the body; feet and tail ciliated with strong white hairs.

- Sorex fodiens*, (PALLAS.) SCHREB. Säugth. p. 571. LINN. Syst. Nat. ed. GMEL. I. p. 113. FLEM. Brit. An. p. 8. JENYNS, Brit. Vert. p. 18. BLAS. Säug. Deutsch. 120. NILSS. Skand. Faun. 37.
- „ *Daubentonii*, ERXL. Syst. 124. GEOFF. Ann. Mus. XVII. p. 176. FR. CUVIER, in Dict. des Sc. Nat. XXXIII. p. 425. DESMAR. Mammal. p. 150.
- „ *bicolor*, SHAW, Nat. Misc. t. IV.
- Crossopus fodiens*, WAGL. Isis. 1832. 275.
- Amphisorex Pennanti*, GRAY, Ann. Nat. Hist. II. p. 287.
- „ *linnaeanus*, GRAY, Nat. Ann. Hist. II. 287.

<i>Sorexremifer</i> ,	GEOFF. Ann. Mus. XVII. 182. t. II. f. 1.
„ <i>ciliatus</i> ,	SOW. Brit. Misc. t. xlix.
<i>Musaraigne d'eau</i> ,	DAUBENT. Mém Acad. des. Sc. 1756, p. 211. BUF- FON, Hist. Nat. VIII. p. 64, t. xi. f. 1.
<i>Water Shrew</i> ,	PENNANT, Brit. Zool. I. p. 125, t. ii.

IN the first edition of this work, the present species, with the Common Shrew, was placed in the Genus *Sorex*, but the difference observable in its dentition, which is also observed in some exotic species of *Soricidæ*, added to the adaptive character exhibited by the ciliated feet and tail, have induced us to follow the example of Professor Blasius in regarding it as generically distinct. The name of *Crossopus*, given to it by Wagler, in the “Isis” for 1832, must of course hold precedence over that of *Amphisorex* bestowed on it by Duvernoy in 1834.

The habits of this beautiful little creature are clearly indicated by the peculiarities of its structure. Possessing the same general conformation as the former species—the same soft short silky coat—a body similarly gracile, and a snout almost equally attenuated,—the addition of stiff cilia to the sides of the toes, and the greater breadth of the feet, together with the fringe of hairs on the under surface of the tail, show that its ordinary pursuits require the use of oars and rudder; and that while, like all the other species of the family, its food consists of insects, it is in the water that this food is to be obtained.

The observations of several intelligent naturalists have not only confirmed this conclusion, but have afforded many curious details as to its mode of life; and we find that its habits are no less interesting than its form and movements are elegant and pleasing.

An intimate friend, in whose capabilities for accurate observations we place the greatest reliance, being one day

concealed, gun in hand, for the purpose of shooting some carrion crows, near a hillside ditch, at Temple Grafton, near Stratford-on-Avon, had his attention called to a Shrew of this species, which was busily engaged in seeking for food amongst the stones in the rapid but shallow water at the bottom of the ditch. These it turned over, or displaced, by forcing itself under them, and in this manner several of large size, compared with that of the animal itself, were removed. The food appeared to be taken at the moment the stone was raised from its resting-place, though in some instances by the animal merely poking its long snout under the stone, without lifting it; but in every case, when caught, it was conveyed to the side to be devoured. It consisted of some small creatures having hard parts, which the Shrew was heard crunching up in the process of mastication.

Shortly afterwards the spot was pointed out to us, and, on examination, we found the pretty stream Sessile-eyed Crustacean, *Gammarus Pulex*, in plenty under the stones in the ditch, and entertained but little doubt that it was on these small crustaceans that the Shrew was feeding, and that the crushing sound observed during mastication was occasioned by their hard coverings.

We do not know whether the Water Shrew is piscivorous in its habits, though it is not unlikely that it may feed on the spawn or fry of minnows, or other small fish, but to its carnivorous propensities we can ourselves bear testimony. Having occasion to enter an outhouse used as a carpenter's shop, at Welford Hill, we were somewhat surprised to hear the shrill chattering squeak of a Shrew, and its quick rustle, or rather rush, amongst the shavings upon the floor. Remaining still for a few minutes, we

saw an animal of the present species emerge from the shavings, and, scampering across a large sheet of brown paper, pass under the dried body of a barn-door fowl, which was lying in a corner. On lifting up the fowl by the legs, the Shrew made its escape from a hole in the abdomen, and it was found on examination that nearly all the internal parts, in a half dried and half decomposed state, had been devoured, though whether wholly by the Shrew or in part by Mice we are unable to state.

Another equally well authenticated and interesting notice of its flesh-consuming habits may with advantage be introduced here. A brother of one of the authors of the present work, having one night placed a steel trap for vermin, visited it the following morning; and on drawing near, saw that it contained a full-grown Rat, on which was perched a small black object, which proved on closer approach to be a Water Shrew.

The Rat was dead, and the Shrew was devouring it. Although the slender snout and the projecting and comparatively weak teeth of the Shrew were but ill-adapted, one would have thought, for devouring prey of the size of a full-grown Rat, yet the animal had succeeded in making a small hole through the skin; and this it was most energetically employed, by means of both teeth and claws, in enlarging. So ferocious were its actions, that it might very properly be said to be *fighting* the Rat; and so intent was it on its work, as to suffer itself to be captured by the observer, who laid the loading-rod of his gun across its back. We have once, and once only, seen it at Selborne. It was hunting in the most active and curious manner at the bottom of a small roadside stream; and as its body was much flattened, the white of the belly projected in a narrow border, edging the deep black of

the back, and rendering it altogether the prettiest object imaginable.

According to the account given of one of them by Mr. Dovaston,* to whom we are indebted for the first detailed description of its manners, "It dived and swam with great agility and freedom, repeatedly gliding from the bank under water, and disappearing under the mass of leaves at the bottom, doubtless in search of its insect food. It very shortly returned and entered the bank, occasionally putting its long sharp nose out of the water, and paddling close to the edge. This it repeated at frequent intervals from place to place, seldom going more than two yards from the side, and always returning in about half a minute. Sometimes it would run a little on the surface, and sometimes timidly and hastily come ashore, but with the greatest caution, and instantly plunge in again." Its swimming is principally effected by the alternate action of the hinder feet, which produces an unequal or wriggling motion: it makes its way, however, with great velocity; and as it swims rather superficially, with the belly flattened, the sides, as it were, spread out, and the tail extended backwards as a rudder, it forms a very beautiful and pleasing object, moving on the calm surface of a quiet brook, or diving, in an instant, after its food, its black velvety coat becoming beautifully silvered with the innumerable bubbles of air that cover it when submerged; and on rising again, the fur is observed to be perfectly dry, repelling the water as completely as the feathers of water-fowl. When submerged, the ear is nearly closed by means of three little valves. It is attacked by the Weasel, which will even

* Lond. Mag. II. p. 219.

follow it into the water, where, however, it readily saves itself by diving. It burrows under the margin of the bank ;—a safe and commodious habitation, from which it can, at the first alarm, throw itself into the water and elude pursuit.

It is often found at some distance from the water. There can be no doubt that it frequently seeks its food on the land, perhaps when it has exhausted the ditch or brook to which it has attached itself ; for it appears, from Mr. Dovaston's account, to remain for a long season the denizen of one chosen spot, where it pairs, and probably rears its offspring.

The female, which is a little smaller than the male, produces from five to seven or eight young. Some assert that nine is the ordinary number ; but hitherto we have not ourselves seen more than six.

It is remarkable that so beautiful and interesting an animal should for a long time have been so entirely unknown or neglected by the naturalists of this country, especially when it is considered that its presumed rarity can only be attributed to the want of observation ; as numerous localities have been ascertained since Mr. Dovaston recalled our attention to it. It has been met with in Scotland, and is too common in most parts of England to render an enumeration of localities necessary. In other European countries also it appears to be so well known that we refrain from particulars, but may remark that we are unaware whether it has been seen in Ireland, and we do not find it associated with our two other species of Shrews by Dr. Leopold Von Schrenck, in his work on the Mammalia of the Amoor River. A Shrew of this genus from the Himalayas has been described by our friend Dr. Gray under the name

of *Crossopus Himalayaicus*, which, if distinct from the present species, is certainly closely allied to it.

The black and silky fur of the upper part in this species, and its elongated snout, have given rise to the opinion in some places that it was a small species of Mole; to which both the structure and habits of the whole genus indicate a very near affinity.

The snout of the Water Shrew is less attenuated than that of the Common Shrew, and somewhat depressed; eyes very small; ears very short, furnished with three internal lobes, one of them fringed with white hair, which, reaching to the surface of the fur, indicates the situation of the ear by a small white spot: anterior teeth ferruginous at the tips; body broader and more full than in *S. vulgaris*; tail rather slender, quadrangular, compressed at the tip, fringed with stiff hairs beneath; feet rather broader than in the former species, formed for swimming, having a lash of stiff white hairs on the edge of the toes; fur short, soft, and silky. The colour of the upper parts, including the head, back, flanks, and outer surface of the fore and hind-legs, a rich brownish black; the under parts nearly pure white, the line of demarcation between the two colours being generally abrupt; a dusky spot around the pubis.

The Water Shrew is subject to considerable variation in colour, and this at one time led to the belief that more than one aquatic species existed in this country. The most remarkable variety is that which was described as the Oared Shrew in the first edition of this book, and as *Sorex ciliatus* by Sowerby, and *S. remifer* by Geoffroy. The Rev. Leonard Jenyns, in a paper on "The Smaller British Mammalia," which appeared in the

“Annals and Magazine of Natural History” for 1841, when speaking of *Sorex ciliatus*, says: “I have seen so many intermediate specimens, in point of colour, between this and the last species (*S. fodiens*), that I consider it extremely doubtful whether they be distinct.” In 1845 we received at one time as many as eighteen specimens, which had been all taken in a low and moist meadow by the side of the Warwickshire Avon, near to the village of Welford. Of these, one had the uniform black colour of *S. ciliatus*, and six had the well-defined black and white of *S. fodiens*, whilst the remainder presented every intermediate shade in the colouring of the under parts. In a few there was a slight yellowish tinge on the breast. A careful inspection showed that all those having the under parts white, had teeth of a very dark-brown colour, and unworn, whilst in those which had those parts clouded or blackish, the teeth light yellowish brown in colour, and considerably worn. These examples were taken during haymaking, and in the harvest of the same year, four others were brought to us which had been taken by some mowers in a barley-field at Welford Hill, about a mile from the meadow above mentioned, consisting of dry sandy soil, and considerably removed from any water. In these individuals the black of the upper parts was graduated into pale grey beneath, strongly stained and spotted with yellowish chestnut on the throat and breast, and in all of them the teeth were much worn, and pale in colour. We were at the time led to suspect, from the worn condition of the teeth, that the colouring of the under parts might be due to age and season, and to this opinion we still adhere, notwithstanding that we have met with a few—though but a few—similar specimens

in the winter season, since we have subsequently found them by no means rare during the summer.

Dimensions :—

	Inch. Lines.	
Length of the head and body	3	3
„ of the head	1	0
„ of the tail	2	1
„ of the ears	0	1½
„ of the hind-foot and claws	0	8¼
„ of the fore-foot and claws	0	5
„ from end of nose to eye	0	6¼



Genus, *Meles*. (Cuv.)

BADGER.

Generic Character.—Second incisive tooth in the lower jaw placed behind the others ; grinders $\frac{5}{6}$, in an uninterrupted series ; feet plantigrade ; a glandular pouch underneath the tail, having a transverse orifice.

THE BADGER.

BROCK. GREY. BAWSENEO-PATE.

Meles taxus.

- Ursus taxus*, SCHREIB. Säug. III. t. 142.
Ursus meles, LINNÆUS, Syst. Nat. XII. p. 70.
Meles vulgaris, DESMAR. Mammal. p. 173, sp. 266.
 „ *taxus*, FLEM. Brit. An. p. 9. JENYNS, Brit. Vert. p. 10.
Le Blaireau, BUFFON, Hist. Nat. VII. p. 104, t. vii.
The Badger, PENN. Brit. Zool. I. p. 85, t. viii.

SINCE the extirpation of the Bear, *Ursus arctos*, of the existence of which mention is made in Scottish history as

late as in the year 1073, the family of the *Ursidae* * has had no other representative, in our indigenous zoology, than the present animal, which in its habits, no less than in its structure, claims no very remote relationship to that tribe.†

Heavy, sleepy, and slothful—endowed with but a moderate degree of intellect, and with instincts dull and obtuse, it yet possesses a character and qualities which, if not peculiarly interesting and intelligent, are far from being disgusting and ferocious; and if it do not boast the admirable sagacity and lively attachment of the Dog, it is yet free from the cunning and rapine of the Fox, and the fierceness and treachery of the Cat. Its favourite haunts are obscure and gloomy; it retires to the deepest recesses of woods, or to thick coppices covering the sides of hills; and there, with its long and powerful claws, digs for itself a deep and well-formed domicile, consisting of more than one apartment. The general form of the elongated but robust body—the long taper muzzle, terminating in a movable snout—the hard coarse hair—the loose and leathery skin, the low and plantigrade limbs, and the fossorial character of the claws, combine to fit the Badger for a subterranean abode, and to enable it to form that abode by its own labour. Here it sleeps during the greater part of the day, coming abroad only for a short period in the evening or night, to seek its sustenance, in the choice of which it exhibits as completely an omnivorous a

* The Bear tribe.

† Since the above was written, the genus *Meles* has been shown to possess intimate zoological affinities with the *Musteladæ*. Our friend Mr. Waterhouse—perhaps the highest existing authority on what relates to Mammalia—has traced gradations through a series of genera, from *Meles* to *Mustela*; but as we believe in certain points of relationship between the *Musteladæ* and the *Ursidae*, we, for the present, shall retain the Badger in the latter family.

character as perhaps any animal with which we are acquainted. Its food, in fact, consists indifferently of various roots, earth-nuts, beech-mast, fruits, the eggs of birds, some of the smaller quadrupeds, frogs, and insects. Buffon states that it digs up wasps' nests for the sake of the honey,—a fact which has received an interesting confirmation from the observation of a correspondent of Loudon's "Magazine of Natural History," who seems, however, to attribute the destruction of these nests to the fondness of the Badger for the larvæ of the wasp, as he says that the combs were found scattered about, but none were left that contained the maggots. As no wasp in this country lays up a store of honey, like the bee, it is but too obvious that it can only rob the nests for the sake of the larvæ; yet if a predilection of the Badger for honey has elsewhere been observed, it offers a striking analogy to several others of the group, particularly to its Oriental relation the Ratel, *Mellivora Capensis*, which is known to live principally upon it.

The Badger is endowed with astonishing strength of jaws, which is aided by the peculiar manner in which the lower is articulated with the upper, the condyle being received deeply into the glenoid cavity, which bends over it, before and behind, so as to retain it permanently in its place. It also possesses great general muscular power; and these means of inflicting injury, combined with the defensive coat of mail afforded by its strong leathery hide, and rough long shaggy hair, render him a formidable enemy to attack or to cope with. Such qualities as these formerly occasioned the cowardly and barbarous amusement of Badger-baiting, now probably but little known, to be a favourite and exciting sport amongst our rustic population. The poor devoted Badger was put into a small tub or barrel, or some such

place of partial protection, and there baited by numerous Dogs, collected without much regard to breed, though the Rough Terriers were the favourites; and it would be difficult to say whether the cruelty were greater to the persecuted Badger, or to his canine tormentors.

The gradual cessation of these barbarous and dastardly sports is indeed one of the necessary results of the spread of education, which at once produces a taste for the substitution of intellectual for mere animal sources of enjoyment, and supplies the means for its indulgence; but there is, in the present instance, another cause for the decline of this amusement, perhaps as efficient as the former,—which is, the numerical decrease of the species itself: and were it not for this, it is to be feared that a humane interposition to save an unhappy Badger from this tormenting persecution, might still chance, in some places at least, to be met with honest Dandie Dinmont's astonished exclamation, “Lord save us,—to care about a Brock!” The recollection of the custom, however, will continue to be interesting to the philologist when the custom itself shall long have passed away, as having given rise to a common expression, which will probably be perpetuated as part and parcel of our language. A person who is beset by numerous assailants is said to be “badgered.”

The Badger is taken in various ways. The favourite mode, and that which is perhaps the most successful, is by catching him in a sack placed at the entrance of his hole. The haunt of a Badger being ascertained, a moonlight night is chosen, when he is out feeding, and a small sack is placed within the mouth of the hole, fastened at the outside, with the mouth of the bag outwards, and having a running string round it. Two or three couples of hounds are then thrown off at some distance: and as

soon as the Badger hears their cry, he makes for his home with all speed, and runs into the sack, which closes behind him by the tightening of the running string at its mouth. Another method is by digging him out. This plan, however, is always laborious, and often attended with uncertain results, arising from obstacles in the shape of large roots, stones, or from the position of the hole, which is not unfrequently in the front of some steep bank or cliff, in which situation the Badger could only be reached by mining horizontally, a proceeding attended with immense labour. Nevertheless, Badgers are frequently taken by means of the spade, and we have often conversed with men engaged in their capture, in some parts of Oxfordshire, where they are still common. In the well-known, but now little worked, slate quarries of Stonesfield, the Badger finds a stronghold from which it would be difficult to dislodge him. The intricate passages and crevices in these excavations, while they furnish to this animal a commodious retreat, afford also an efficient means of defence against the entrance of dogs, which in their attempts to dislodge the Badger, often get fixed between the stones, and perish. There are other places also in the same neighbourhood, and in the adjoining Gloucestershire or Cotteswold Hills, where the Badger is still found, as in the forest of Wichwood, in Ditchley Park and woods, at Oddington, Addlestrop, and at Daylesford, in the park planted by Warren Hastings. Temple Guiting, Seizencote, and Chipping Campden are other localities in the vicinity of which the Badger occurs. We have been careful to enumerate the above localities, as we think that in some of them these animals have rather increased than diminished in numbers within the last few years, a fact which is certainly rather remarkable, when we consider the large size of the

animal, and the increase of population in this country. But it is probable that the oolitic district to which we have alluded, with a very undulating surface, and thickly spotted with parks, woods, and coppices, containing broken ground and deserted quarries, and, moreover, in many places of a very friable nature, in which not only Badgers but Foxes and Rabbits can speedily establish extensive burrows, is of all others the kind of habitat suitable for the Badger. At any rate, we find that there are many wilder and less frequented districts in which the Badger is comparatively rare. The burrow is usually a round horizontal hole or tunnel, the end of which is turned upwards abruptly for about a foot, and the vertical part of the hole leads into a rounded excavation, of just sufficient size for the animal to lie coiled up in. When the burrow is increased in length, the extension takes place in the same level as the first or horizontal part, leaving the dormitory like an upstairs room. It is not unusual in a long burrow to find several of these resting-places, but always placed above the line of the burrow in such a manner as to ensure good drainage, and to place the animal in a position of advantage on the approach of an enemy within his abode.

“If taken young, the Badger may be easily and completely tamed. I had one for a considerable time, which was sent to me by my late valued friend, James Buckland, Esq., of Shaftesbury, who had obtained it from a cottager in the neighbourhood, whose children Mr. Buckland accidentally saw playing with the Badger as familiarly as they would with a puppy. He found that the animal had been taken when very young, and had been brought up as the playmate of the children; it had, however, become rather too rough in its fondness, and the poor man was willing to part with it. It thus

came into my possession, and soon became a great favourite, showing, too, on its part, great attachment to me and to the household. It followed me like a Dog, yelping and barking with a peculiar sharp cry, when he found himself shut out of the room in which I happened to be sitting. He was accustomed to come into the dining-room during dinner, of which he was generally permitted to partake, and he always ate his morsels in a very orderly manner. He was, in fact, an affectionate, gentle, good-tempered fellow, and very cleanly withal. He died of the disease which destroys so many carnivorous animals when in a state of confinement—a stricture of the pyloric opening of the stomach, by which the passage of the food into the intestine is gradually interrupted, and ultimately stopped.”*

The male and female Badger are rarely seen in company. It is probable that the sexes are directed to each other by scent, and that the fetid secretion from the glandular pouch under the tail is intended in this, as in many other instances, to afford them traces of each other. The female brings forth her young in the summer, to the number of three or four in a litter. Her nest is formed of moss and grass, and is prepared beforehand for the reception of the young.

The Badger, as we have already stated, is still found in many parts of England, but is nowhere abundant, and in some places has become a rare animal. It is a native of almost every country in Europe, not excepting the North. M. Nilsson includes it in his Scandinavian Fauna, and it occurs, according to Prof. Schinz, in the Alps. Dr. Eversman met with it in Buckhara, and Dr. L. von Schrenck gives a variety of it in his work on

* Brit. Quad. 1st Edition, p. 125.

the Mammalia of the Amoor river, as *Meles taeni*, var. *Amurensis*. The Badger was known to the ancients, for Pliny speaks of it, though but cursorily, but Aristotle does not even allude to it.

The word Badger is of very uncertain origin. Skinner derives it from the Teutonic "Back," the jaw, *quasi* "Backer," on account of the great strength of that part in this animal. The Anglo-Saxon "Broc"* is still retained in Scotland and in the northern counties of England; it is also termed "Grey," and "Bawsened-pate;" the word Bawsened meaning striped with white.

As far as we have observed, it is only borne in Heraldry as "canting arms;" it occurs in the coats of Badger and Brock.

The body is robust, though somewhat elongated; the legs are short, and the body consequently low; but it appears more so than it really is, in consequence of the length of the hair on the belly, which even reaches to the ground. The head is taper, and the muzzle produced; the ears small and rounded, and nearly hidden in the long hair of the sides of the head; the eyes small; the tongue smooth; the number of the grinding teeth is variously stated by different naturalists as being $\frac{1}{3}:\frac{4}{3}$, $\frac{1}{6}:\frac{4}{6}$, $\frac{2}{3}:\frac{2}{3}$, or $\frac{2}{6}:\frac{2}{6}$, according as a small rudimentary false molar exists or is wanting, immediately behind the canine, above or below. In a cranium in our possession it is wanting in both jaws; and, on the contrary, Desmarest gives the higher number, from a specimen in which it existed in both; whilst in Frederic Cuvier's figure and description it is wanting in the upper and exists in the lower. The second incisive tooth in the lower jaw is placed behind the other two.

* Many places still retain the name originally given, from the occurrence of the "Broc"—Brockbridge, in the parish of Selborne—Brockenhurst, &c.

The back is rounded. The tail very short, not extending farther than the middle of the hinder legs. Feet hairy, particularly the hinder ones, with five toes on each, armed with strong curved fossorial claws. Hair of the body long, loose, and of three colours,—white, black, and reddish, the union of which produces a rich grey, which varies in tint in different parts. Head white, excepting a band of black, commencing between the nose and the eye, and extending backwards, and widening so as to include the eye and ear, the latter being white at the tip. Lower jaw, throat, breast, and belly, the interior of all the legs and the feet, black; the back, shoulders, and rump, reddish grey; the sides and tail light grey.

Dimensions :—

	Feet.	In.	Lines.
Length of the head and body	2	3	0
„ of the head	0	6	3
„ of the ears	0	2	0
„ of the tail	0	7	6
Height at the shoulder	0	11	0



CARNIVORA.

MUSTELADÆ.

Genus, *Lutra*.

OTTER.

Generic Character.—Body elongated and low ; feet with five toes on each, palmated ; tail flattened horizontally ; incisive teeth $\frac{5}{6}$, grinders $\frac{2}{3}:\frac{2}{3}$ or $\frac{2}{3}:\frac{2}{3}$; tongue slightly rough ; ears small.

COMMON OTTER.

Lutra vulgaris.

Specific Character.—Deep brown ; throat and breast cinereous ; tail more than half the length of the head and body.

- Lutra*, RAY, Syn. Anim. Quad. KLEIN, de Quad. p. 91.
Mustela lutra, LINN. Syst. Nat. XII. 1, p. 66.
Viverra lutra, LINN. Faun. Suec. 2, p. 5.
Lutra vulgaris, ERXLEB. Syst. p. 448. DESMAR. Mam. p. 188, sp. 289.
 FLEM. Brit. An. p. 16. JENYNS, Brit. Vert. p. 13.
Lutra Rocsnsis, OGILBY, P.Z.S. 1834, III.
La Loutre, BUFFON, Hist. Nat. VII. p. 134, t. ii.
Common Otter, PENN. Brit. Zool. I. p. 92, No. 19, t. viii. SHAW, Gen. Zool.
 I. p. 437, t. c.

WITH the general form and aspect which characterize its family, the Otter exhibits many modifications of that

typical structure which are necessary to fit it for its aquatic and piscivorous habits. The generally elongated body is much flattened horizontally; the tail is flat and broad, forming an admirable rudder; the legs are short, and so loosely articulated as to allow of their being turned in every direction in the act of swimming; the feet are broad, and the toes distant and connected by a complete web; and the skin is protected by a compact fur, consisting of two very different kinds of hair;—the shorter being very soft and fine in its texture, to preserve the body from sudden changes of temperature; and the longer, coarse, hard, and shining, which presents a very smooth unresisting surface as the animal cuts the water in its course. The teeth, too, though essentially similar to those of the rest of the group, are particularly strong, and their tubercles very pointed,—by which structure the animal is enabled to seize and to hold securely its scaled and slippery prey.

From this conformation it is evident that every facility, consistent with the preservation of its structural relations to the rest of the group, is given to the Otter for the pursuit and capture of its proper food. It swims and dives with great readiness, and with peculiar ease and elegance of movement; and although its action on land is far from being awkward and difficult, yet it is certainly in the water that the beautiful adaptation of its structure to its habits is most strikingly exhibited. It swims in nearly a horizontal position, and dives instantaneously after the fish that may glide beneath it, or pursues it under water, changing its course as the fish darts in various directions to escape from it, and, when the prey is secured, brings it on shore to its retreat to feed.

As the Otter lives exclusively on fish, when it can procure them, it frequents lakes, rivers, smaller streams

or ponds, and not unfrequently descends to the sea: and the havoc which it makes amongst the finny inhabitants is almost incredible. In feeding, it holds the fish between its fore-paws, eating first the head, and then downwards to the vent, leaving the tail. But it is not only to those which are necessary for its sustenance that its ravages are restricted,—for, as honest Izaak Walton says very truly, “The Otter devours much fish, and kills and spoils much more than he eats.”

The accounts which some writers have given of its habits are greatly exaggerated. We read of its excavating a very artificial habitation, burrowing under ground to a considerable distance; making the aperture of its retreat always under water, and working upwards, forming here and there a lodge, or dry resting-place, till it reaches the surface of the ground at the extremity of its burrow, and making there a breathing-hole, always in the middle of a bush or thicket.* This statement is wholly incorrect. The Otter avails itself of any convenient excavation, particularly of the hollows beneath the overhanging roots of trees which grow on the banks of rivers, or any other secure and concealed hole near its fishing haunt; though in some cases it fixes its retreat at some distance from the water, and, when driven by a scanty supply of fish, it has been accused of resorting far inland, to the neighbourhood of the farmyard, and attacking lambs, sucking-pigs, and poultry,—thus assuming for a time the habits of its more terrestrial congeners. This we believe, however,

* It is worthy of remark that this erroneous account of the retreat of the Otter is almost exactly similar to the haunt of the *Ornithorhynchus*, as described by Mr. George Bennett, in the Transactions of the Zoological Society: though the former is to be found in books published ages before the latter animal was discovered.

it does only when driven from its proper haunts by severe and continued frost. The obvious difficulty of making detailed observations on the habits of an animal like the Otter, when in its native haunts, will, we hope, be sufficient excuse to our readers for the insertion of the following somewhat trivial remarks, the only merit of which consists in their accuracy:—In 1850 we observed an old pollard ash standing on the bank of a small stream called the Stour, running into the Avon near Stratford, which was frequented by an Otter. The tree was hollow, and had been partly undermined by the action of the water, and its interior rendered accessible from the stream, though not from the river-bank. A narrow platform, or stair of earth, was the only lodgement which the tree afforded, and on this, without the least interposition of soft or warm material, the Otter had evidently, from its padded and smooth appearance, been accustomed to lie. The presence of hairs sticking upon the moist earth, as well as bones and scales of fish, sufficiently indicated the nature of the frequenter of this retreat. In order to reach the top of the platform, the creature had to climb up the front of it, which being of clay, and rendered soft by its contiguity to the water, was deeply scored and ground by the Otter's nails. A large steel trap was placed on the mud, under water, near to the tree, but the only result was that the place was abandoned. A short time afterwards our attention was called to a well-beaten track through an osier-bed in the Avon, a mile or two down stream, evidently the run of some large animal, which, coming from the water at one end of the bed, passed again into it at the other. There could be no doubt that it was the track of an Otter, some fragments of fish serving to confirm the opinion, which the inspection of the run itself pointed

out. Again the trap was brought into requisition, and placed under water as before, in such a position that it was supposed the Otter would make use of it as a stepping-stone, when going into or out of the water. However, it proved, as on the former occasion, to be a failure, and the trap, remaining undisturbed, was after a time removed to the run itself and carefully covered, and on the following day was found to contain a female Otter, weighing 14 lbs. A few days later another was similarly captured, and at the same spot; a male, weighing 18 lbs. We had often heard from the Avon fishermen that the Otter was always observed to travel over rather than under or around anything, when passing up or down stream, and our own observation in the instance just given confirms their statement. It is also asserted by these men that an Otter will often travel many miles in a single night; and to this statement, too, we can add our own testimony, having on one occasion tracked one for several miles in the snow, sometimes on one side of the stream, and sometimes on the other; and occasionally it appeared to have proceeded for a distance of a quarter of a mile in the water, though apparently not for the purpose of securing food, as it had evidently emerged from the water, and at once passed on, on its way.

It is asserted by some that the Otter confines its haunts to the rivers and lakes, never descending to the sea. This, however, is a mistake. In the northern parts of Scotland they certainly frequent the sea, and extend their rambles to a considerable distance from the shore; and Mr. Couch, of Polperro, states that "in the summer, and when the weather will permit, it occupies a retired and quiet station where the land stretches into the ocean. It swims low in the water, and will go a mile or more after its prey. The neighbourhood of a populous har-

bour is a frequent station. Fishes," continues Mr. Couch, "seem to have an instinctive dread of the Otter; for I am credibly informed that it has been seen to collect into a shoal a vast number of trouts in a river, and to drive them before it until the greater part have thrown themselves on shore."

Otter-hunting, formerly one of the most interesting and exciting amusements of which the English sportsman could boast, has of late years dwindled into the mere chase of extirpation. It was in other days pursued with much of the pomp and circumstance of regular sport: the Dogs were chosen for their perseverance and resolution; "good Otter-hounds," says an old sportsman,—and Mr. Daniel mentions a cross between the Harrier and a Terrier as producing a good breed for the purpose,—“will come chaunting and trailing along by the river-side, and will beat every tree-root, every osier-bed, and every tuft of bulrushes;—nay, sometimes they will take the water, and beat it like a Spaniel.” The huntsmen and others of the party carried Otter spears, to strike the Otter when driven within their reach; horsemen and footmen joined in the chase; and the whole company formed a cavalcade of no inconsiderable extent and importance. These scenes are now no longer witnessed, or but rarely, in England; but in Wales the chase of the Otter is still kept up with some spirit, in certain romantic districts of that romantic country. The sketch from which the vignette is taken, was kindly drawn for us by our lamented friend, the late John Morgan, Esq., and forms one of his memoranda of a day's chase of this animal amidst the wild and picturesque scenery of Glamorganshire.

In beating for an Otter, it is necessary to mark the character and direction of his “seal,” or footmark, in the

mud or soil, as well as the recent or older appearance of his "spraints," or dung. These signs of his having been either remotely or more recently on the spot will afford a tolerably certain indication whether the animal be still in the neighbourhood, or whether a further search must be made for later marks of his presence. When the Otter is found, the scene becomes exceedingly animated. He instantly takes the water, and dives, remaining a long time underneath it, and rising at a considerable distance from the place at which he dived. Then the anxious watch that is kept of his rising to "vent," the steady purpose with which the Dogs follow and bait him as he swims, the attempts of the cunning beast to drown his assailants, by diving whilst they have fastened on him, the baying of the hounds, the cries of the hunters, and the fierce and dogged resolution with which the poor hopeless quarry holds his pursuers at bay, inflicting severe, sometimes fatal wounds, and holding on with unflinching pertinacity even to the last,—must altogether form a scene as animated and exciting as the veriest epicure in hunting could desire.

The return from such a day's sport as this in the county of Carmarthen is thus described by a correspondent of the *Sporting Magazine*:—"Sitting near the window, I beheld approaching the bridge a cavalcade, and found it was Squire Lloyd of Glansevin, escorted by the gentlemen of the neighbourhood, returning from Otter-hunting. The gentlemen in the front rank were mounted; and next the horsemen were three men neatly dressed in scarlet coats and white trousers, with long spears, on which were suspended three huge Otters. Now the huntsman appeared with his well-disciplined hounds; and then followed the cart, with nets, spears, and other paraphernalia; and an old ballad-singer ap-

peared in the rear, who sang the praises of the high-bred hounds and their worthy master." Alas! that worthy "Squire Lloyd of Glansevin," the warlike deeds of whose ancestors were doubtless recounted and sung by the voices of a score of bards, should have the peaceful triumphs of his Otter-hunt chaunted by "an old ballad-singer!" The finest Otter-hunting on record, however, is probably that of a party in Essex, who, in the year 1796, killed nine Otters in one day.

That the Otter may not only be readily and easily tamed and domesticated, but taught to catch and bring home fish for its master, is a fact which is so well known, and has been so often proved, that it is surprising it should not have been more frequently acted upon. From Albertus Magnus down to the late excellent Bishop Heber, instances have been continually narrated, some of which have gone no further than the domestication of pet Otters, whilst in others the animal has been rendered a useful purveyor of fish for the family table. Amongst other writers who have attested similar facts, honest Izaak Walton says, "I pray, sir, save me one [young Otter], and I'll try if I can make her tame, as I know an ingenious gentleman in Leicestershire, Mr. Nicholas Seagrave, has done; who hath not only made her tame, but to catch fish, and do many other things of much pleasure." Albertus Magnus, Aldrovandus, Gesner, and others, had asserted it; yet Buffon, losing for once his accustomed credulity, and running to an opposite extreme, refuses to believe in the susceptibility of the Otter to be brought to a state of domesticity. The former of these writers states that, in Sweden, Otters were kept in the houses of the great for the express purpose of catching fish, which they would do at a signal from the cook, and bring home their provender to be dressed for dinner.

Numerous instances have been recorded in later times, by Daniel, Bewick, Shaw, and others; in one of which an Otter had been known to take eight or ten salmon in a day: and the following passage in the journal of Bishop Heber confirms some previous statements, that one of the Asiatic species, probably *Lutra nair* (Fr. Cuv.), may be rendered similarly useful:—"We passed, to my surprise, a row of no less than nine or ten large and very beautiful Otters, tethered with straw collars and long strings to bamboo stakes on the banks (of the Matta Colly). Some were swimming about at the full extent of their strings, or lying half in and half out of the water; others were rolling themselves in the sun on the sandy bank, uttering a shrill whistling noise, as if in play. I was told that most of the fishermen in this neighbourhood kept one or more of these animals, who were almost as tame as Dogs, and of great use in fishing; sometimes driving the shoals into the nets, sometimes bringing out the larger fish with their teeth. I was much pleased and interested with the sight. It has always been a fancy of mine that the poor creatures whom we waste and prosecute to death, for no cause but the gratification of our cruelty, might, by reasonable treatment, be made the sources of abundant amusement and advantage to us." This interesting account justifies the conclusion drawn by the good prelate from the scene that so much delighted him, that "the simple Hindoo shows here a better taste and judgment than half the Otter-hunting and Badger-baiting gentry of England." With such instances as these before us, there seems to be no reason why this animal, so tractable and docile as it is proved to be, should not be very generally domesticated for the purposes of sport, or employed by fishermen as a means of assisting them in their calling.

The method which has been recommended to train them to this purpose is as follows:—They should be procured as young as possible, and they are at first fed with small fish and water. Then bread-and-milk is to be alternated with the fish, and the proportion of the former gradually increased till they are led to live entirely on bread-and-milk. They are then taught to fetch and carry, exactly as dogs are trained to the same trick; and when they are brought to do this with ease and docility, a leather fish stuffed with wool is employed for the purpose. They are afterwards exercised with a dead fish, and chastised if they disobey or attempt to tear it; and finally, they are sent into the water after living ones. In this way, although the process is somewhat tedious, it is believed that the Otter may be certainly domesticated, and rendered subservient to our use.

The fur of the Otter is very much valued in many other countries, but has been less employed in England. Great numbers of the skins of the American Otter are annually imported here, to be again exported to the North of Europe, &c.*

The female goes with young nine weeks, and produces from three to five young ones, in March or April. The nest is formed of grass and other herbage, and is usually placed in some hole in the bank of a river, protected either by the overhanging of the bank, or by the projecting roots of a tree.

The habits of the Otter, and its rank fishy taste, have

* The number of Otter-skins imported into this country in

1830	was	713,115
1831	„	494,067
1832	„	222,493
1833	„	23,889

After September 1st, 1833, the duty was reduced from $\frac{1}{2}d.$ each to 1s. per hundred, since which we believe the importation has gradually increased.

procured for it the distinction of being permitted by the Church of Rome to be eaten on maigre days. The quiet humour of good old Izaak Walton could not rest without a sly hit at this fact:—

“*Piscator.* I pray, honest huntsman, let me ask you a pleasant question: do you hunt a beast, or a fish?

“*Hunt.* Sir, it is not in my power to resolve you; yet I leave it to be resolved by the College of *Carthusians*, who have made vows never to eat flesh. But I have heard the question hath been debated among many great clerks, and they seem to differ about it; yet most agree that *her tail is fish*: and if her body be fish too, then I may say that a fish will walk upon land (for an Otter does so), sometimes five or six or ten miles in a night.”

Now, were we to adopt the reference recommended by honest Izaak, the description of this animal would have fallen within the province of our late lamented friend, Mr. Yarrell, rather than ours; for, says Pennant, “in the kitchen of the Carthusian convent near Dijon, we saw one preparing for the dinner of the religious of that rigid order, who, by their rules, are prohibited during their whole lives the eating of flesh.”

In Daniel’s *Rural Sports* occurs the following notice of a spotted variety of the Otter:—“In Scotland the vulgar have an opinion that there is a king or leader among the Otters, spotted with white, and larger. They believe that it is never killed without the sudden death of a man or of some animal at the same instant; that its skin is endowed with great virtue as an antidote against infection, a preservative of the warrior from wounds, and ensures the mariner from all disasters upon the sea.” In Stoddart’s work on Angling, a similar notice occurs; and Mr. Blyth, when living at Tooting, favoured us with the following information:—“On my inquiry of an

Aberdeenshire friend if he knew of the Spotted Otter, he at once answered that he supposed I meant the King of the Otters; showing that at least it is currently known. My friend even knew of a rivulet where one had been taken, though he himself had never seen it." It is doubtless the same variety as that mentioned by Desmarest, and stated by Lesson to have been found near Paris. The specimen alluded to is in the Museum of the Jardin des Plantes, and is of a lively yellowish brown colour, whitish brown beneath; the sides of the head, the throat, and the upper parts of the neck, whitish; and the whole of the upper part of the fur irregularly spotted with pure white. It is by no means rare to see an Otter having a few white spots, though they are rarely as much marked as the one above mentioned. It appears to be a variety analogous to that which often occurs in birds having a few white feathers, which at the moulting period are often lost, and replaced by others of ordinary colour. This variety should not be confounded with albinism, which is retained for life.

There is in the Museum of the Zoological Society of London a beautiful specimen of an Irish Otter, presented by Mr. Ogilby, who considers it to be a distinct species from that of England. "On account of the intensity of its colouring, which approaches nearly to black, both on the upper and under surface; of the less extent of the pale colour beneath the throat, as compared with the Common Otter as it exists in England; and of some difference in the size of the ears, and the proportions of other parts; Mr. Ogilby has long considered the Irish Otter as constituting a distinct species; and he feels strengthened in this view of the subject by the peculiarity of its habits and manners. It is, in fact, to a considerable extent a marine animal, being found chiefly

along the coast of the county of Antrim, living in hollows and caverns formed by the scattered masses of the basaltic columns of that coast, and constantly betaking itself to the sea when alarmed or hunted. It feeds chiefly on the salmon; and as it is consequently injurious to the fishery, a premium is paid for its destruction, and there are many persons who make a profession of hunting it, earning a livelihood by the reward paid for it, and by disposing of its skin." Mr. Ogilby had not had an opportunity of comparing it minutely with the Common Otter, or of examining its osteology; until this had been done, it was premature to admit it as a distinct species; and we may be allowed to add, that in the stuffed specimen above mentioned, we have not found characters sufficiently distinct to lead to the belief that it is more than a very dark and handsome variety of the common species; and in this opinion of its identity with the common species, we are supported by that of Prof. Blasius. The Otters of Zetland are equally marine in their habits, and judging from two beautiful skins presented by John Bruce, Esq., of Sumburgh, they are almost as dark-coloured: these skins are evidently larger than those usually found in England, and the fur is nearly as fine as those imported from America. The size of the Otter varies considerably even in England. The usual weight of a fine male is from twenty to twenty-four pounds; that of the female, about four pounds less; but Pennant records one which was found in the year 1794 in the river Lea, between Hertford and Ware, the weight of which was forty pounds. The Otter has been met with in China, in the Amoor River, and given in the work which we have before quoted by Dr. Leopold Von Schrenck, on the Mammalia of that district, together with another species, the *Lutra aterrima* of Pallas.

The head is broad and flat; the muzzle very broad; the upper lip thick, and hanging over the lower, which it partly conceals; whiskers very thick and strong; eyes situated an inch behind the nostrils, small, black, the cornea remarkably prominent; ears short and rounded; body very long and low; legs short; feet palmate, the toes being furnished with a perfect and strong interdigital web, and with short claws, which are somewhat turned up, though not retractile. Tail little more than half as long as the body and head together, very broad and strong at the base, and flattened horizontally: two small glands, secreting a fetid liquid, under the tail.

The fur consists of two distinct and very different kinds of hair; the shorter being extremely fine and soft, of a whitish grey colour, and brown at the tips; the longer hair stiffer and thicker, very shining, greyish at the base, bright rich brown at the points, especially on the upper parts and the outer surface of the legs; the throat, the cheeks, the breast, belly, and inner parts of the legs, brownish grey throughout.

Dimensions of a specimen from Sutherlandshire:—

	Feet.	In.	Lines.
Length of the head and body	2	1	6
„ of the head	0	4	10
„ of the ears	0	0	8
„ of the tail	1	4	0

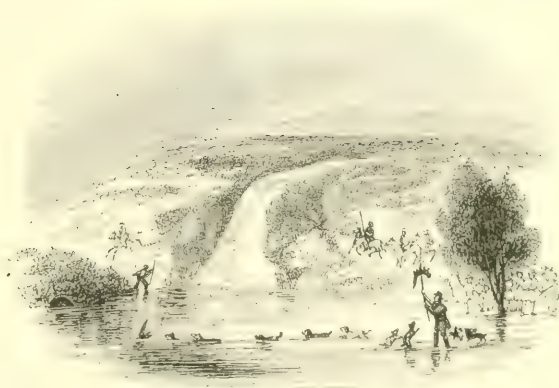
The specimen taken in the Warwickshire Avon, to which we have alluded, and which weighed 14 lbs., had the following dimensions:—

	Feet.	In.	Lines.
Length of the head and body	2	4	9
„ of the head	0	5	6
„ of the ears	0	0	6
„ of the tail	1	3	0

A male taken at the same time as the last-mentioned example (which was a female) weighed 18 lbs., and had a total length of $3\frac{1}{2}$ feet.

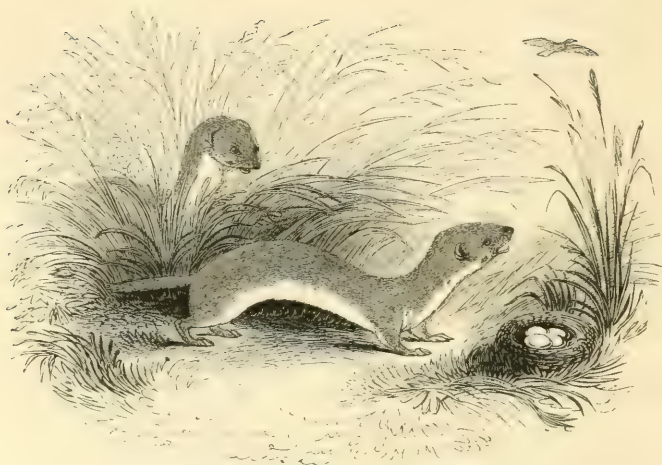
Dentition:—

$$I. \frac{6}{6} : C. \frac{2}{2} : F. M. \frac{6}{6} : M. \frac{4}{4} = \frac{18}{18}$$



CARNIVORA.

MUSTELADÆ.

Genus, *Mustela*.

WEASEL.

Generic Character.—Body elongated, vermiform; feet short; toes separate; claws sharp; ears small; grinding teeth $\frac{4}{3}$; tongue rough.

COMMON WEASEL.

Mustela vulgaris.

Specific Character.—Reddish brown above, white beneath; tail of the same colour as the upper part of the body.

Mustela vulgaris, LINN. Syst. Nat. DESMAR. Mam. p. 179, sp. 275. FLEM.
Brit. An. p. 13. JENYNS, Brit. Vert. p. 12.

Viverra vulgaris, SHAW, Gen. Zool. I. 2, p. 240.

Foetorius vulgaris, KEYS. and BLAS. Wirbelth. Europ. p. 69, n. 147. BLAS.
Saugth. Deutsch. p. 231.

La Belette, BUFFON, Hist. Nat. VII. p. 225, t. xxix. f. 1.

Common Weasel, PENNANT, Brit. Zool. I. p. 95, t. vii. No. 17. SHAW, Gen.
Zool. I. p. 420, t. xcvi.

With the fur white.

Mustela nivalis, LINN. Fn. Suec. II. p. 7.—Syst. Nat. I. p. 69. MULL.
Zool. Prod. p. 3.

THE near approximation in figure and character, and the great general similarity in habits, which a comparison between the Stoat and Weasel presents, have occasioned considerable confusion in some of the accounts which have been given of their history ; though the difference of size and colour would at once be sufficient to distinguish the species, were there no other points of disagreement between them. The Stoat is brown above, dirty white beneath ; the tail always black at the tip, longer and more bushy than that of the Weasel, and the former animal is twice as large as its elegant little congener ; the Weasel, on the other hand, is red above, pure white beneath, the tail red and uniform. Their habits also, though generally similar, are, in many of their details, considerably distinct ; and we are fully borne out by observation, in saying that the accusations which are so current against the Weasel, of the mischief which he is said to perpetrate in the farmyard and the hen-roost, as well as amongst game of every description, on Hares and Rabbits no less than on the feathered tribes, are principally due to the Stoat.

It is not meant to be asserted that the Weasel will not, when driven by hunger, boldly attack the stock of the poultry-yard, or occasionally make free with a young Rabbit or a sleeping Partridge ; but that its usual prey is of a much more ignoble character, is proved by daily observation. Mice of every description, the Field and the Water Vole, Rats, Moles, and small birds, are their ordinary food ; and from the report of unprejudiced observers, it would appear that this pretty animal ought rather to be fostered as a destroyer of vermin, than extirpated as a noxious depredator. Above all, it should not be molested in barns, ricks, or granaries, in which situations it is of great service in destroying the colonies of

Mice which infest them. Those only who have witnessed the multitudinous numbers in which these little pests are found, in wheat-ricks especially, and have seen the manner in which the interior is sometimes drilled, as it were, in every direction by their runs, can at all appreciate the amount of their depredations;* and surely the occasional abduction of a chicken or a duckling, supposing it to be even much more frequently chargeable against the Weasel than it really is, would be but a trifling set-off against the benefit produced by the destruction of those swarms of little thieves.

The Weasel climbs trees with tolerable facility, and surprises birds on the nest, sucks the eggs, or carries off the young, and will creep, as we know from personal observation, along the boughs and twigs of a hawthorn hedge in search of the nests. It has been asserted that it attacks and destroys snakes: this, however, we believe to be entirely erroneous. We have tried the experiment by placing a Weasel and a common snake together in a large cage, in which the former had the opportunity of retiring into a small box in which it was accustomed to sleep. The mutual fear of the two animals kept them at a respectful distance from each other; the snake, however, exhibiting quite as much disposition to be the assailant as its more formidable companion. At length the Weasel gave the snake an occasional slight bite on the side or on the nose, without materially injuring it, and evidently without any instinctive desire to feed upon it; and at length, after they had remained two or three hours together, in the latter part of which they appeared

* A friend of ours assures us that at least three bushels of different species of Mice have been killed out of one wheat-rick. We have ourselves often seen great numbers killed on the removal of a rick. But, with few exceptions, they have been of the common species, *Mus musculus*.

almost indifferent to each other's presence, we took the poor snake away and killed it.

Far different was this Weasel's conduct when a Mouse was introduced into the cage: it instantly issued from its little box, and, in a moment, one single bite on the head pierced the brain, and laid the Mouse dead without a struggle or a cry. We have observed that when the Weasel seizes a small animal, at the instant that the fatal bite is inflicted, it throws its long lithe body over its prey, so as to secure it should the first bite fail; an accident, however, which we have never observed to occur when a Mouse has been the victim. The power which the Weasel has of bending the head at right angles with the long and flexible, though powerful neck, gives it great advantage in this mode of seizing and killing its smaller prey. It also frequently assumes this position when raising itself on the hinder legs to look around.

The disposition which has been attributed to the Weasel of sucking the blood of its prey, has, we believe, been generally much exaggerated. Some persons have positively denied the existence of such a propensity, and our own observation, as far as it goes, would tend to confirm that refutation of the commonly received notion. The first gripe is given on the head, the tooth in ordinary cases piercing the brain, which it is the Weasel's first act of epicurism to eat clean from the skull. The carcase is then hidden near its haunt, to be resorted to when required, and part of it often remains until it is nearly putrid.

The Weasel pursues its prey with facility into small holes, and amongst the close and tangled herbage of coppices, thickets, and hedgerows. It follows the Mole and the Field Mouse in their runs; it threads the mazes formed in the wheat-rick by the colonies of Mice which

infest it; and its long flexible body, its extraordinary length of neck, the closeness of its fur, and its extreme agility and quickness of movement, combine to adapt it to such habits, in which it is also much aided by its power of hunting by scent,—a quality which it partakes in an equal degree with the Stoat. In pursuing a Rat or a Mouse, therefore, it not only follows it as long as it remains within sight, but continues the chase after it has disappeared, with the head raised a little above the ground, following the exact track recently taken by its destined prey. Should it lose the scent, it returns to the point where it was lost, and quarters the ground with great diligence till it has recovered it; and thus, by dint of perseverance, will ultimately hunt down a swifter and even a stronger animal than itself. But this is not all. In the pertinacity of its pursuit, it will readily take the water, and swim with great ease after its prey.

It is, however, sometimes itself the prey of hawks; but the following fact shows that violence and rapine, even when accompanied by superior strength, are not always a match for the ingenuity of an inferior enemy. As a gentleman of the name of Pinder, then residing at Bloxworth, in Dorsetshire, was riding over his grounds, he saw, at a short distance from him, a kite pounce on some object on the ground, and rise with it in his talons. In a few moments, however, the kite began to show signs of great uneasiness, rising rapidly in the air, or as quickly falling, and wheeling irregularly round, whilst it was evidently endeavouring to force some obnoxious thing from it with its feet. After a short but sharp contest, the kite fell suddenly to the earth, not far from where Mr. Pinder was intently watching the manœuvre. He instantly rode up to the spot, when a Weasel ran away from the kite, apparently unhurt, leaving the bird dead,

with a hole eaten through the skin under the wing, and the large blood-vessels of the part torn through. A similar anecdote is related in Loudon's Magazine of Natural History, where the *dramatis personæ* were a Stoat and an eagle; but the truth of it appears not to be vouched for by the narrator. Of the accuracy of the present fact there is, however, no doubt, as we knew Mr. Pinder well, and have often heard the circumstance related.

The female Weasel is much smaller than the male, and is no doubt the "little reddish beast, not much bigger than a Field Mouse, but much longer," mentioned by White in his Natural History of Selbourne, and called "Cane" by the people of that district. It is known in Surrey also by the name of "Kine," as Mr. Blyth has informed us. We have received specimens of this animal from several parts of England, and find, as may be supposed, that it is nothing more than the female Weasel of unusually small size. She brings forth four, or more frequently five young, and is said to have two or three litters in a year. The nest is composed of dry leaves and herbage, and is warm and dry, being usually placed in a hole in a bank, in a dry ditch, or a hollow tree. She will defend her young with the utmost desperation against any assailant, and sacrifice her own life rather than desert them; and even when the nest is torn up by a Dog, rushing out with great fury, and fastening upon his nose or lips.

We have ourselves had several opportunities of observing the nest of the Weasel, and in every instance it was placed in a hole in the ground, which from its size had much the appearance of having been constructed by the animal herself. The smallest number of young observed was four, and the greatest six. Seating our-

selves on one occasion in a place of concealment, near one of these nests, we saw the parent bring, in a little more than an hour, five Mice for her young, which were playing in and out of the hole. On the arrival of the mother with the fifth, we shouted, causing a hasty retreat, the Mouse, which we wished to examine, being left behind. It proved to be a full-grown specimen of the Field Vole, *Arvicola agrestis*, and from the general resemblance which all bore to this one, we have no doubt that they were of the same species. They were carried by the neck, with the body hanging in front of the animal's breast, and not in either instance dragged on the ground; and it was very curious and interesting to see the little creature come marching along with her load, and with neck elevated into a vertical position to hold it high enough to be clear of the ground. Nothing can exceed—scarcely perhaps equal—the playfulness of a nest of Weasels about three-fourths grown. Kittens and puppies are proverbially playful, but they are no match in this respect with the young creatures of which we are now speaking. They will take hold of each other, and roll over and over with such rapidity, and cut so many antics, that the eye can scarcely follow their movements; and then, perhaps, darting into their hole, one after another, will in a few moments again appear, and repeating their gambols again disappear, and so on, until the arrival of the mother, when all will follow her into the hole, and remain there for some time after she has again gone forth in quest of more food. We have always observed that the young, even when fully three-fourths grown, venture only a few yards from the hole, and make not the least attempt to purvey for themselves.

Sometimes, though rarely, the Weasel becomes white in the winter; and the tail, though paler than at other

times, always retains its reddish tinge, as that of the Ermine does its black tip. In this state it is the *M. nivalis* of Linnæus. One which we received from the extreme north of Scotland had two white spots on each side of the nose, which it retained through the summer.

The name is Teutonic; the Anglo-Saxon word being "Wesle," and the Danish "Væsel;" which latter, however, is equally applied to the Ermine.

We have chosen to retain the generic appellation *Mustela* for the present form, in preference to *Putorius*, applied to it as a sub-genus by Cuvier, because we consider it as the type of the family; for which reason also, the word *Martes* having been assigned by Ray to the Martens, we have retained it for that genus instead of *Mustela*. Count Keyserling and Professor Blasius, in their work on the European Vertebrata, "Die Wirbeltheire Europas," have rejected the genus *Martes*, and made use of the old Linnæan one, *Mustela*, for the Martens; whilst for animals of which we are now treating they have formed a new genus called *Fætorius*. We see no sufficient reason, however, for rejecting the name of *Martes*, assigned by Ray to the Martens, and shall continue the same generic names for this group which were made use of in the former edition of this work.

It will be unnecessary for us to mention specially the different countries in which the Weasel is found, excepting to state that it is distributed over the whole of Europe, and has been met with near the Amoor River by Dr. Von Schrenck.

The general form and aspect of the Weasel show it to be typical in the group of vermiform Carnivora. The body is extremely slender and arched; the head small and flattened; the eyes black, and remarkably quick

and lively; the ears short and rounded: the neck is very long, being but little shorter than the trunk, and very flexible; the tail short, not one-third the length of the head and body, smaller than that of the rest of the genus, and without the terminal tuft of long hair which exists in the Stoat; legs short, and furred to the end of the toes; fur short and close. The colour of the upper part of the head, neck, and body, the tail, the feet, and the outer surface of the legs, is a light reddish brown; the whole of the inferior parts quite white. Dimensions:—

		Inch. Lines.			Inch. Lines.	
Length of the head and body (of the male)		8	3	(of the female)	7	0
„ of the head	„	1	9	„	1	6
„ of the ears	„	0	4	„	0	3
„ of the tail	„	2	6	„	2	0



CARNIVORA.

MUSTELADÆ.



ERMINE WEASEL.

STOAT, STOUT, GREATER WEASEL.

Mustela erminea. (Linn.)

Specific Character.—Body reddish brown above, white beneath (in winter wholly or partially white) ; extremity of the tail black.

Mustela erminea, LINN. *Fn. Suec.* II. p. 6, n. 17.—*Syst. Nat.* I. p. 68.
DESMAR. *Mammal.* p. 180, sp. 277. *FR. CUVIER*, in
Diet. des Sc. Nat. XXIX. p. 250. *FLEM. Brit. An.*
 p. 13. *JENYNS*, *Brit. Vert.* p. 13.

Viverra erminea, SHAW, *Gen. Zool.* I. p. 426, t. xcix.

Proctotus Erminca, KEYS. and BLAS. *Wirbelth. Europ.* pp. 69, 145. *BLAS.*
Wirbelth. Deutsch. I. p. 228.

In the summer dress :—

Roselet, BUFFON, *Hist. Nat.* VII. p. 240, t. xxxi. f. 1.

Stoat, PENN. *Brit. Zool.* p. 84.

In the winter dress :—

L'Hermine, BUFFON, l. c. p. 240, t. xxix. f. 2.

Ermine, PENN. l. c. p. 84.

THE habits of the Stoat or Ermine, in this country at least, differ from those of the Weasel, principally with relation to the difference of size. Although much more

destructive than that animal to poultry and to game, the favourite object of its pursuit is the Common Rat, the Water Vole, and the Rabbit; as that of the Weasel is the different species of Mice. Although prevented from following the latter little pests into their runs, which are often not much larger than their own bodies, the Stoat nevertheless destroys a great many, as we have seen a considerable number of Mice brought by a female Stoat to her young ones; but perhaps the portability of the prey may in this instance have been considered. It occasionally attacks Hares, even when full-grown, pursuing them with the utmost pertinacity, and hunting them down by dint of its indefatigable perseverance. The late Rev. F. W. Hope informed us that on one occasion, when shooting in Shropshire, he heard at a short distance the shrill loud scream of a Hare, which he concluded was just caught in a poacher's springe. On running towards the spot from which the sound proceeded, he saw a Hare limping off, greatly distressed, with something attached to the side of the throat, which a nearer approach showed to be a Stoat. The Hare made its way into the brushwood with its enemy still holding on. The following anecdote, related to us by the late Mr. Wells, of Redleaf, in Kent, affords another remarkable instance of the tenacity with which the Stoat retains its hold on its prey, and at the same time offers a somewhat ludicrous example of the real value of newspaper art-criticism:—Being on a visit to that gentleman, one of the beautiful Landseers in his fine collection having attracted our attention, he gave the following relation respecting it. Some years before, Mr. (now Sir Edwin) Landseer, being at Redleaf, the keeper brought in a dying Hare, with a Stoat still hanging to its throat. The painter seized the oppor-

tunity, and immediately made a sketch of the curious group which he afterwards elaborated, with his unrivalled talent, into the beautiful picture which was now the object of our admiration. The picture was duly exhibited at the Royal Academy; and in the ordinary critique on the exhibition which appeared in one of the papers of the day, was the following notice of it:—
“No —. We do not consider this one of Mr. Landseer’s happiest efforts. We never saw a *Rabbit* so large, nor a *Ferret* of this colour!” It is a curious fact, that the Hare, when pursued by the Stoat, does not betake itself to its natural means of escape, its fleetness of foot, which would in a few seconds carry it out of all danger from its little enemy, and which it always employs when escaping from the chase of Dogs or of the Fox; on the contrary, it hops languidly along, evidently aware of the Stoat’s approach, yet as if incapable of exerting its powers to avoid the impending destruction. Whether this arises from a stupid indifference, or from not appreciating its danger, or, on the other hand, from intense terror, producing an effect similar to that mis-called fascination, which the small bright eye of the Rattlesnake excites in its helpless victims, it is perhaps difficult to decide.

We are, however, somewhat disposed to believe that the apathy proceeds from a silly ignorance of danger, as we have seen a Hare watching the approach of a Stoat, apparently with great curiosity, and certainly without the least appearance of fear, and occasionally sitting up on her hind legs, to get a better view. The actions of the Stoat, meanwhile, were not less remarkable than those of the Hare. Instead of making a direct approach, it committed a hundred extravagant movements, rolling over and over, leaping up, and even turning summersaults,

but nevertheless gradually approaching its victim, which, excepting for our interference, it would doubtless have shortly pounced upon and destroyed.

The Stoat is certainly one of the boldest animals of its size. It pursues its prey with the greatest intrepidity, even into circumstances of considerable danger, and, like the Weasel, will follow it into the water: it will also cross the water for the purpose of besieging the haunts of the Water Vole, *Arvicola amphibius*, of which it destroys great numbers. In swimming, "it lifts the head and neck well out of the water, like a Dog." That the Stoat is also an expert climber, the following statement will fully show:—Mr. W. B. Tomes being attracted by the clamour of some sparrows in a tree, on looking up, saw some brown object projecting from the entrance of a nest of one of these birds, which was in the top branches of the tree. A shot from his fowling-piece brought down a Stoat, whose fore parts had been concealed within the nest, the contents of which the animal was doubtless making free with. We saw the tree shortly afterwards,—an ash, with a clear bole of ten inches in diameter, such as we should have thought it scarcely possible for a Stoat to ascend. It hunts its prey by scent;—a fact observed by the father of the author of our former edition very many years since, and more recently stated by our friend Mr. Hogg, in his interesting paper on the habits of the Stoat, to which we shall have occasion again to refer. In short, in all these circumstances, its habits are exactly similar to those of the Weasel. Like that animal, too, it is known often to make use of the excavations of the Mole for its winter retreats.

Of all the animals with which we are acquainted, the Stoat is the most playful. Not even the lively Squirrel,

nor yet the Weasel (so long noted for its activity and vigilance, as to have furnished a theme for a popular song, and an equally well-known proverb), can vie with the Stoat in the activity and eccentricity of its gambols. We have occasionally seen one on a bit of bare ground, or closely browsed turf, suddenly dart off into the most extravagant antics imaginable, running at top speed in every direction, backward and forward, lunging from side to side in its course, and alternately showing its brown back and white belly ; then, perhaps, rolling over and over, leaping into the air, or turning a summersault, and then back again, forming a double summersault ; and at last, perhaps, bounding off and away in a series of leaps, which scarcely any other creature of its size could accomplish.

But it is not merely when disposed for a game of play that the Stoat will show these antics. We have already alluded to the playful demeanour of one when within sight of a Hare ; and we may here further remark that the same propensity is often exhibited when in the energetic pursuit of prey. The scent—to use a sporting phrase—is frequently followed by making a series of casts, backward and forward, across the direct line, and at each double the Stoat will make a leap or turn a summersault.

The female brings about five young ones in the month of April or May.

We have seen the young ones, about the haymaking season, of nearly the size of the mother, but showing not the least inclination to cater for themselves, spending the whole of the time when she was absent foraging, in playing with each other near the mouth of the hole, which in all the instances we have met with was in a dry bank.

The winter change of colour which this species so universally assumes in northern climates, is not only matter of much interest to the naturalist and the physiologist, but, as we shall presently see, of considerable importance also in a commercial point of view. The whole of the coloured parts of the fur become of the purest white, excepting the extremity of the tail, which remains permanently black; and the under parts retain a slight yellowish tinge. This is effected, not by the loss of the summer coat and the substitution of a new one for the winter, but by the actual change of colour in the existing fur. It is not easy to offer a satisfactory theory for this phenomenon, but we may perhaps conclude that it arises from a similar cause to that which produces the grey hair of senility in man, and some other animals: of this instances have occurred in which the whole hair has become white in the course of a few hours, from excessive grief, anxiety, or fear; and the access of very sudden and severe cold has been known to produce, almost as speedily, the winter change in animals of those species which are prone to it. This transition from one state of the coat to the other does not take place through any gradation of shade in the general hue, but by patches here and there of the winter colour intermixed with that of the summer, giving a pied covering to the animal.

In northern latitudes, even in the alpine districts of Scotland, this change is universal; but farther south it becomes an occasional, and even rare, occurrence. In Northumberland, Durham, and other counties in the north of England, it is very frequent, although far from general; in Lincolnshire, Cambridgeshire, and the Midland Counties generally, it is sometimes seen; and there are two specimens of the Ermine in the Museum

of the Philosophical Society of Cambridge taken in that county. Mr. Couch, of Polperro, states that he has seen it more than once in Cornwall.

An intelligent labourer at Selbourne, whose habits of life formerly gave him greater opportunity of observing the *ferè naturè* than would be strictly legal, assures us that he has repeatedly seen the Stoat in its white dress, and occasionally in its pied or transition colours, in that neighbourhood. One in this state of partial change, killed on Selbourne Hill, we have ourselves presented to the Alton Museum.

It appears to be established that, whatever may be the change which takes place in the structure of the hair, upon which the alteration of colour immediately depends, this transition from the summer to the winter colours is primarily occasioned by actual change of temperature, and not by the mere advance of the season. The observations of our friend John Hogg, Esq., contained partly in an excellent paper on the subject in the fifth volume of Loudon's "Magazine of Natural History," and partly in a letter with which he has favoured us since the publication of that paper, tend amply to confirm this view of the matter. "Within the last nine years," says Mr. Hogg, writing from the county of Durham, "I have had the good fortune to meet with two Ermines alive, and in two of the most different winters that have occurred for a great many years: the one was in the extremely severe winter of January to March, 1823, and the other was in the almost as extremely mild January of the present year (1832). In consequence of the months of December, 1831, and January, 1832, having been so extremely mild, I was greatly surprised to find this Stoat clothed in his winter fur; and the more so, because I had seen, about three weeks or a month before, a Stoat in its summer coat or

brown fur. I was therefore naturally led to consider whether the respective situations, which the brown and white Stoats seen by me this warm winter inhabited, could alone account for the difference of the colours of their fur in any clear and satisfactory manner. The situation, then, where the brown Stoat was seen, is in N. lat. $54^{\circ} 32'$ nearly, and W. long. $1^{\circ} 19'$ nearly, upon a plain elevated a very few feet above the level of the river Tees, in the county of Durham. Again, the place where I met with the Ermine, or white Stoat, on the 23rd of January, 1832, is in the North Riding of Yorkshire, in N. lat. $54^{\circ} 12'$ nearly, and W. long. $1^{\circ} 13'$ nearly: it is situated at a very considerable elevation, and in the immediate neighbourhood of the lofty moorlands called the Hambledon Hills. These constitute the south-western range of the Cleveland Hills, which rise in height from 1,100 feet to 1,200 feet above the sea. At the time, the Ermine was making its way towards the hills, where, no doubt, he lived, or frequently haunted; and, consequently, the great coldness of the atmosphere, even in so mild a winter, upon so elevated and bleak a spot as that moorland, would satisfactorily account for the appearance of the animal in its white fur; although the place is, in a direct line, more than twenty-three miles distant to the south of the fields near the Tees inhabited by the brown Stoat."

We have repeatedly seen the Stoat in Warwickshire more or less marked with white; and having examined a considerable number of specimens, can from our own experience make a pretty accurate statement of the commencement and progress of the change in the colour of the fur, which occasions this piebald and peculiar appearance. The first indications of alteration in colour are such as might readily escape observation. It is on the

basal or brown part of the tail and on the toes that the white first makes its appearance ; and after this, the white of the belly extends upwards on the animal's sides, thus destroying the regularity of the line where the brown and white meet ; about the same time the limbs become powdered with white. A more advanced stage shows the limbs and root of the tail white, and the brown of the back reduced to a narrow stripe, excepting on the rump, which, with the head and hind neck, is the latest to change ; and, in fact, these parts rarely become quite white in this country.

The following statement of an experiment recorded in the account of the former voyage of Captain Ross to the Polar regions, offers an interesting confirmation of the theory above offered, though the animal which was the subject of it belonged to a very different group. It was the Hudson's Bay Lemming :—

“As it retained its summer fur, I was induced to try the effect of exposing it to the winter temperature. It was accordingly placed on deck in a cage on the 1st of February ; and next morning, after having been exposed to a temperature of 30° below zero, the fur on the cheeks and a patch on each shoulder had become perfectly white. On the following day the patches on the shoulders had extended considerably, and the posterior part of the body and flanks had turned to a dirty white. At the end of a week it was entirely white, with the exception of a dark band across the shoulders, prolonged posteriorly down to the middle of the back.” It is unnecessary to pursue the details of this cruel but conclusive experiment further ; it obviously proves that a low temperature alone is sufficient to blanch the fur in such animals as are susceptible of such a change. It also clearly shows that the view which we have taken of the mode in which this

change takes place, by the actual change of colour in the existing fur, is the true one.

But what is the *final cause* of this curious phenomenon? What object connected with the well-being of the subjects of it does it effect in their favour? One object, undoubtedly, is the safety they obtain by the concealment afforded them, by an approximation to the colour of the earth's winter covering. The Ptarmigan, the Alpine Hare, and many other mammalia and birds, are all more or less liable to become the prey of rapacious birds or quadrupeds, which are directed in the chase by their sight. The mottled browns which form the principal summer colours of these creatures, are well adapted for their concealment amongst the brown heaths and fern of the summer and autumn; but such colours would render them conspicuous by contrast amongst the snows of winter.

But this, though perhaps the most obvious, is not the most important advantage gained by the assumption of the white clothing in the winter season. It is too well known to require more than an allusion, that although the darker colours absorb heat to a greater degree than lighter ones, so that dark-coloured clothing is much warmer than light-coloured, when the wearer is exposed to the sun's rays—the radiation of heat is also much greater from dark than from light-coloured surfaces, and consequently the animal heat *from within* is more completely retained by a white than by a dark covering; the temperature, therefore, of an animal having white fur, would continue more equable than that of one clothed in darker colours, although the latter would enjoy a greater degree of warmth whilst exposed to the sun's influence. Thus the mere presence of a degree of cold, sufficient to prove hurtful, if not fatal, to the animal, is

itself the immediate cause of such change in its condition as shall at once negative its injurious influence.

This winter change of the fur, and the permanency of the black colour of the tail, render the fur of the Ermine one of the most beautiful and valuable. When made up, the tails are inserted, one to each skin, at regular distances, and in the quincunx order; and the pure white of the skin is thus relieved and set off by the rich black of the tail. It is not only much used for the winter garments of ladies, but it forms the distinctive doubling of the robes of state of kings and nobles, as well as of their crowns and coronets. The early employment of this fur for such uses occasioned its introduction amongst the tinctures of heraldry, in which it is frequently adopted, either as the ground of the shield, or the colour of the bearings.

The few specimens of the fur which could be obtained in this country, even in the northern parts of the island, are very inferior, in beauty and value, to those which are imported from those far northern climates in which they abound, as Russia, Norway, Siberia, and Lapland; where they must be exceedingly numerous, as our own importation alone in 1833 amounted to 105,139. The great superiority of these northern skins consists in the fur being longer, thicker, and of a purer and brighter colour.

Besides being generally distributed in Europe, the Stoat has been met with by the Russian naturalist, Dr. Von Schrenck, in the vicinity of the Amoor River, in China.

The derivation of the word Stoat is very probably, as Skinner has it, from the Belgic "Stout," bold; and the name is so pronounced in Cambridgeshire and in some other parts of England to the present time. Gwillim, in his "Display of Heraldrie," gives the following etymology of Ermine:—"This is a little beast, lesse than a

Squirrel, that hath his being in the woods of the land of Armenia, whereof hee taketh his name."

The Stoat is about one-third larger than the Weasel, which in its form it almost exactly resembles; the head is a little broader in proportion to its length, and the tail longer. The upper part of the head, neck, and body, and the greater part of the tail, are of a pale reddish-brown colour; the under parts white, with a very slight tinge of yellow; margins of the ears and toes white; tip of the tail black, and somewhat bushy. In the winter, the whole of the body becomes white, slightly tinged with yellow, the extremity of the tail remaining permanently black. In the autumn and in the spring it is found pied with patches of the summer colour, intermixed with the white of winter. Dimensions:—

	Female.		Male.	
	Inch.	Lines.	Inch.	Lines.
Length of the head and body	9	0	10	9
.. of the head	2	0	2	3
.. of the ears	0	4½	0	5
.. of the tail	4	8	6	5



CARNIVORA.

MUSTELADÆ.



FITCHET WEASEL.

FITCHER, POLECAT, FOU MART, FULIMART.

Mustela putorius.

Specific Character.—Fur long, dark brown on the surface, yellowish beneath; head blackish, with white spots about the ears and mouth; tail about one-third the length of the head and body.

Mustela putorius, LINN. Fn. Succ. II. f. 6. —Syst. Nat. I. p. 167. DESMAR Mammal. p. 177, sp. 271. FLEM. Brit. An. p. 14. JENYNS, Brit. Vert. p. 11.

„ *eversmani*, LESSON, Man. p. 144.

Viverra putorius, SHAW, Gen. Zool. I. p. 415, t. xcviii.

Foetorius putorius, KEYS. and BLAS. Wirbelth. Europ. p. 62. BLAS. Wirbelth. Deutsch. p. 222.

Putois, BUFFON, Hist. Nat. VII. p. 199, t. cxviii.

Fitchet Weasel, PENNANT, Brit. Zool. I. p. 89, t. vi.

Polecat, SHAW, Gen. Zool. I. c.

THE Fitchet, Fitcher, or, as it is more frequently termed, the Polecat, although smaller than either of the Martens, is the largest of the indigenous species of the restricted genus *Mustela*. In its habits it greatly resembles the two former species; but instead of being contented with the lesser quadrupeds and birds, it attacks

Rabbits, Hares, or Partridges, and commits great ravages in the hen-house or poultry-yard, where it destroys great numbers, not only of chickens and ducklings, but of full-grown poultry; and even ventures to attack geese and turkeys;—no less than sixteen of the latter large and powerful birds having been known to be killed by a single Polecat in the course of one night: for, like the other species of the genus, it takes advantage of opportunity, and destroys many more than it can eat at once; and after making an epicurean repast on the brains, and quenching its thirst with the blood of its victims,—in which peculiarities it probably exceeds most of the other Weasels,—it carries off the carcases to its haunts, where portions of them are often found in a state of putridity. Their usual place of retirement is in woods or coppices situated at no great distance from farms; from whence they issue about the dusk of evening, or later, to prey upon any living thing, of manageable size, which may come within their reach. Nevill Wood, Esq., of Foston Hall, in Derbyshire, has informed us that “some years ago he had ten fine young ducks, which were shut up every night in a small outhouse, destroyed in one night by a Polecat; and on entering the place in the morning, he found every one of them lying dead, each with a hole in the neck; and in a few moments the perpetrator of the bloody deed marched out towards him, licking his yet bloody jaws, and without exhibiting the slightest alarm. Indeed,” says Mr. Wood, “it is a curious fact, that this animal generally kills all the poultry in the apartment it plunders, be they never so many.”

But if the Polecat be so formidable an enemy to the farmyard, it is not less so to the game-preserve and the warren. The destruction which it occasions amongst the eggs and young of Pheasants and Partridges, young

Hares and Rabbits, is incalculable; and in the latter case particularly, it follows these animals into their burrows with such facility, that a single family of Polecats would shortly produce a sensible diminution in numbers amongst the denizens of a whole warren.

However, of late years, the Polecat, like many other of our indigenous mammals of considerable size, which are fast tending towards extermination, has become much less common, and its depredations are probably confined to such districts as have deep woods and other inaccessible retreats.

Bewick has given a figure of the Fitchet—and a very spirited one it is—in the act of holding an eel which he has just caught. This figure is intended to perpetuate a curious fact, of an individual of this species having been observed repeatedly to resort to the bank of a river in search of those fish, of which no less than eleven were found in its retreat. A no less curious example of aberrant appetite in this animal is related in Loudon's Magazine,* of a female Polecat which was pursued to her nest, where were found five young ones “comfortably embedded in dry withered grass; and where they were lodged, all things were tight and snug to a wonder; but,” says the narrator, “in a side hole I picked out and counted most carefully forty large frogs and two toads. These were all alive, but merely so; capable of sprawling a little, and that was all: for the mother had contrived to strike them all with palsy. They were merely capable of sprawling, and not of moving away; and on examination I found that the whole number, toads and all, were bitten through the brain.” There are numerous facts confirmatory of this predilection for frogs; and it is perfectly consistent with the habits of some of its congeners. A

* Vol. vi. p. 206.

tame Grison, *Galictis vittata*,* which we possessed for several years, was very fond of frogs; but these were not the only reptiles which were obnoxious to its voracity. On one occasion, in the winter, we had placed it in its cage, in a room with a fire, where we had also two young alligators, which in general were stupidly tame; on going into the room in the morning, we found the Grison at large, and one of the alligators dead, with a hole eaten under the fore-leg, where the great nerves and blood-vessels were torn through; and the other alligator began snapping furiously at every one who attempted to approach it.

The female Polecat brings four, five, or six young, in May or the beginning of June. She makes her nest in some retired place, in a rabbit-burrow, in holes of rocks, or amongst heaps of stones grown over with herbage or brushwood.

The long fur of this animal, though far less beautiful and of inferior value to that of the Sable, or even of the Marten, is still much esteemed, and numbers are annually imported here from the north of Europe, under the name of *Fitch*.

The common name of this species, *Polecat*, is probably nothing more than *Polish Cat*. *Foumart*, *Fulmart*, *Fulimart*, are contractions of *Foul Marten*, a name applied to it in contradistinction to the *Sweet Marten*, on account of the disgusting odour produced by the exudation of a fetid secretion from a pouch or follicle under the tail, and which is even more intolerable than that of the Common Weasel or the Stoat.

The general form of the Fitchet is rather stouter in proportion than that of either of the former species, closely resembling, in fact, large examples of the com-

* See Trans. Zool. Soc. Vol. II. p. 203.

mon Ferret: the head is broader; the nose rather sharp; the ears round, and not very conspicuous; the neck of less proportional length than in the others; the tail rather bushy, and little more than one-third the length of the body and head. The fur of the body is of two sorts: the shorter being woolly, of a pale yellowish or fulvous colour; the longer shining, and of a rich black or brownish black. From this results a general brown colour, mixed with yellow, which varies according to the proportion in which the two kinds of fur are seen. The head, tail, and feet are the darkest parts; and some marks about the mouth and the ears are white.

Whether the domesticated Ferret (*M. furo*, *Linn.*) is merely a variety of the Polecat, or a distinct species, is still a subject of dispute among naturalists. It is impossible to point out any constant anatomical distinction between the animals, and they are said to breed freely with one another. On the other hand, the intolerance of cold of the Ferret has been considered as evidence of its being derived from an original stock brought from Africa or some other tropical land.

Dimensions:—

	Feet.	Inch.	Lines.
Length of the head and body	1	5	0
„ of the head	0	3	4
„ of the ears	0	0	5
„ of the tail	0	6	0



Genus, *Martes*. (Ray.)

MARTEN.

Generic Character.—Grinding teeth $\frac{5}{6} \cdot \frac{5}{6}$; body much elongated; feet short, with separate toes; tongue smooth.

COMMON MARTEN.

MARTERON, MARTERN, MARTLETT, STONE MARTEN,
BEECH MARTEN.

Martes foina.

Specific Character.—Greyish-brown; throat white; under-fur whitish. The third upper grinder convex on its outer margin; the fifth notched externally.

Mustela martes, var. *guttare albo*, LINN. Syst. Nat. I. p. 67.

„ *foina*, GMEL. LINN. Syst. Nat. p. 95. DESMAR. Mammal.
p. 182. JENYNS, Brit. Vert. p. 11. BLASIUS Säugeth.
p. 217.

Martes fagorum, RAY, Syn. p. 200. FLEM. Brit. An. p. 14.

„ *saxorum*, KLEIN, Quad. p. 64.

La Fouine, BUFFON, Hist. Nat. VII. p. 161, t. xviii.

Martern, Marteron, MERRETT, Pinax, p. 167.

Marten, PENN. Brit. Zool. I. p. 92, No. 13, t. vi. SHAW, Gen.
Zool. I. p. 409.

THE generic separation of the Weasels from the Martens appears to be perfectly justified by their habits no less than by their structure. Exhibiting the carnivorous and sanguinary propensity in an extreme degree, and confined principally, though not exclusively, to the ground for their accustomed habitation as well as for their food, the whole of the true Weasels possess a still more elongated body than the Martens, with shorter ears and tail, and a closer fur: they have also fewer false grinding teeth, by one on each side, both of the upper and lower jaw. The Martens, on the other hand, reside chiefly in trees, and their structure is admirably suited for such haunts. Creeping from branch to branch in silent and stealthy pursuit of Birds, Squirrels, and other small animals, their sharp and long claws afford them a firm and secure hold of the bark, whilst the long and somewhat bushy tail must considerably aid them in maintaining their balance on the boughs; the ears too are large and open,—a circumstance which is of great advantage to them in discovering and pursuing their prey, amidst the dense foliage in which they love to conceal themselves; and, upon the whole, the typical structure of the Martens is evidently intended to fit them for living in trees, whilst that of the Weasels is as obviously suited for the pursuit of animals not only on the ground, but in the burrows and other subterranean retreats to which their peculiar prey resorts.

It is, however, true that the animals belonging both to the one and the other of these forms, occasionally deviate from the habits which more particularly belong to them. Many of the Weasels are known at times to resort to trees in pursuit of the smaller birds, and especially for the purpose of attacking their nests, from which they devour both eggs and young; whilst the Martens often

descend to the ground and destroy not only Mice, Rats, Moles, and other small quadrupeds, but Rabbits, Hares, and, as it is asserted, even Lambs. They are very destructive to game of every kind, and to all sorts of domestic poultry, from the Pigeon to the Turkey. It has also been stated that in Scotland the Marten, as well as the Fox, will descend to the sea-shore at low tide, and carry off numbers of the large muscle, *Modiola vulgaris*, to feed upon them; and Professor Rolleston speaks of their "fruit-eating tendency when in a state of domesticity, which is significant, as it separates them more or less from the true Weasels."

There are few groups in the whole class of quadrupeds which offer more stubborn difficulties to the zoologist, as regards the discrimination of the species, than the Martens. Agreeing not only in the more essential generic characters, but in the general tone and arrangement of the colours, there has always been some difficulty in ascertaining, especially with the two British Martens, whether they constitute varieties only, or whether they really possess distinctive specific characters. Albertus Magnus, followed by Agricola, Gesner, and Aldrovandus, have all treated of them; though, with the exception of Agricola, they throw but little light upon the present question. He indeed describes them as distinct, and assigns to them the same differences in habit, as have since been attributed to them by Buffon. But Linnæus did not recognize the distinction; and it is only in the last edition of his *Systema Nature*, that he appears even to have been aware of the variety. "Varietas duplex rusticis," he observes; "Fagorum gutture albo; Abietum gutture flavo." Klein and Brisson revived the former opinion of their being distinct; and although Daubenton, with the caution of an

accurate observer of nature, and sincere lover of truth, acknowledges his doubts upon the subject, Buffon embraces and maintains their distinctness with his accustomed sacrifice or distortion of facts, apparently only to afford him an opportunity of displaying the usual eloquence of his comparisons or contrasts. Pennant takes the same view, in which he has been followed by subsequent British faunists, as well as by Blasius in his "*Säugethiere Deutschlands*." Our late valued friend, Edward T. Bennett, Esq., formerly the accomplished secretary of the Zoological Society, drew up an interesting and very lucid statement of these various opinions, and the grounds on which they have been maintained, in his usual masterly manner, including in this comparison the Sable, which future observations may perhaps prove to be merely a variety of the Pine Marten.*

A deliberate consideration of these and other authorities, and a comparison of many specimens of both kinds, had, when the first edition of this work was written, failed to lead us to a conclusion at all satisfactory to our own mind, and it was only with the precaution of a protest against being considered as decidedly supporting the opinion that they are essentially different, that we ventured then to assign to them a distinctive, specific character. Impressed with these difficulties, we some time since invited, through the medium of the

* At the very hour when the author was writing the above sentence, the sanguine hopes which a sudden improvement in Mr. Bennett's health had raised, were at once crushed; and friendship and science have to mourn together a loss which can scarcely be repaired. This excellent person was alike distinguished by the extent of his information, the solidity of his judgment, the affectionate sincerity of his heart, and the high unflinching rectitude of his life. Under a retiring and modest exterior, he possessed qualities which might have adorned a far more public and prominent career than his; but, loving science and his friends for their own sake, he was satisfied with the approbation of the wise, and the affection of those who enjoyed the happiness and privilege of his regard.—*Note to the First Edition.*

"Field," such information from practical observers as might assist us in solving this vexed question; and we have to thank several intelligent correspondents for their courtesy in replying to our request.* The result of all our recent investigations, then, is to confirm us decidedly in the opinion that the two forms are specifically distinct; and this conviction is strongly corroborated by its being held by Professor Rolleston, who, from extensive opportunities of comparing the animals, and from the observation of considerable osteological differences, comes to the same conclusion.

The practical experience of intelligent sportsmen, whose opportunities of personal observation have not been neglected, are always valuable, not only as regards the biography of the animals, but incidentally also as to the scientific phase of the subject. A letter with which we have been favoured from R. T. Vyner, Esq., of Wheatley, in Oxfordshire, while it affords much amusing information on the habits of these and some other of our native animals, throws much light upon the specific distinctness of the two forms, and is confirmatory of the view now taken. This gentleman concludes that the Beech Marten is at present much less common than the Pine, and is, indeed, now very nearly extinct in England, which is accounted for by its habit of leaving its summer haunts of woods and rocky places, to inhabit, in the winter, farm buildings, faggot-stacks, and other similar localities, and thus becoming exposed to various means of destruction. The Pine Marten, on the contrary, continues to inhabit, at all seasons of the year, its

* The gentlemen to whom we are thus indebted are R. T. Vyner, Esq., of The Elms, Wheatley, Oxfordshire; Capt. Edwards, of Tychôs, Haverfordwest; W. H. Wayne, jun., Esq., of Tickwood Hall, Salop; C. H. Binstead, Esq., of Grasmere, Westmoreland; and our friend the Rev. E. Elton. To Prof. Rolleston our thanks are specially due for much interesting information.

accustomed retired haunts, rarely, if ever, intruding into the immediate purlieus of human habitations.

The present species is also found to inhabit the sides of mountains or rocks,—from whence its names of Stone Marten, Stein Marder, *Martes Saxorum*,—where it chooses its retreat in any commodious fissures or excavations. It has now and then been known to take up its abode in the neighbourhood of farms, and to commit continual depredations on the poultry-yard. It is difficult to imagine upon what ground this animal could have been considered as the Pine Marten in a domesticated condition; yet we find Buffon gravely proving the contrary by a comparison of the two with the wild and domestic Cat. The present species is in truth as wild as its congener; and in this respect differs from it only by venturing, with somewhat greater boldness, to the neighbourhood of the habitations of man.

The female makes her nest generally in a hollow tree, but not unfrequently in holes in rocks, sometimes in ruined buildings, or even in granaries and barns: it is formed of straw or grass. She has at least two litters in a year; some assert four: and the number of young ones at each birth varies from two to seven; the usual number being four or five.

The aspect and attitudes of the Marten are perhaps more elegant than those of any other of our native quadrupeds, unless we except the Otter in pursuit of its prey in the water. Endowed with great liveliness and activity, its movements are at once rapid and gracile. Its limbs are elastic, its body lithe and flexible, and it bounds and springs over the ground with equal speed and grace. It is, however, wild and untameable to a great degree, if captured when full-grown, or after a very early age. A specimen formerly in the Zoological

Gardens was excessively timid and wild: if it were driven from its close box into the outer part of the cage, which could only be done by force, it would bound recklessly from one side to another, striking itself against the wires with great violence. If, however, it be taken young, it is susceptible of great docility, and the remarkable elegance of its form, the beauty of its fur, and the playfulness of its manners, when thoroughly reclaimed, render it one of the most pleasing of pets: neither has it in the same degree that disgusting odour which characterizes all the Weasels; for although it has similar scent-glands, the secretion is less fetid, and in the Pine Marten is considered by many to be absolutely agreeable. Hence its name of Sweet Marten, in contradistinction to the Fomart (*quasi* Foul-marten), or Polecat. Mr. Vyner, however, who has taken many specimens when sporting in France, informs us, that on being skinned, a very unpleasant faint odour is perceived, which is not the case with the Pine Marten.

In a very learned and elaborate paper published in the Cambridge "Journal of Anatomy and Physiology," Prof. Rolleston has enunciated the theory that "the white-breasted Marten (*Mustela Foina*) was the animal which the ancient Greeks and Romans employed for the same domestic purposes for which we employ the *Felis domesticus*." He says, "I shall address myself to showing that the white-breasted Marten, which is known also as the 'Beech Marten' or 'Stone Marten,' was functionally the 'Cat' of the Ancients." The paper will well repay careful examination. It exhibits the well-known largeness and originality of the author's criticism, and the subject is exhaustively treated from the literary point of view by very numerous quotations from classical authorities.

The fur of this animal is of much less value than that of the yellow-breasted Marten, and bears no comparison with that of the Sable: there are, however, great numbers imported into this country from the North of Europe, and they are frequently dyed and sold as an inferior kind of Sable. The inferiority of its fur consists not only in the colour and actual length, but in the relative length of the longer hair when compared with the inner soft downy hair, which it scarcely conceals; and hence the texture as well as the colour of the fur is much deteriorated. It is known to furriers by the name of Stone Marten. The length and beauty of this fur, as well as of that of most other animals of the kind, is much increased by the accession of cold weather, from climate or season. Thus the northern skins are more full and of a finer colour and gloss than those from a more temperate climate, and all of them more so in the winter than in the summer.

Professor Rolleston differs considerably from Blasius as to the relative lengths of the two species. He assigns the relative length of the body (including, we presume, the head) and the tail as $18 \text{ in.} + 12 \text{ in.} = 30 \text{ inches}$ to *Martes Abietum*, and $16 + 8 = 24 \text{ inches}$ to *M. Foina*. Blasius gives to the former $17'' 6''' + 3'' 10''' + 9'' = 30'' 4'''$, and to the latter, $17'' + 3'' 8''' + 9'' = 29'' 8'''$.

The head of the Marten is somewhat triangular; the muzzle pointed; the nose extending a little beyond the lips; the eyes large, prominent, and remarkably lively; the ears large, open, and rounded; the body much elongated and very flexible; the tail long, thick, and somewhat bushy; the feet rather short; the toes generally naked, but at times, probably in the winter, covered beneath with a thin soft hair. The fur is of two sorts: the inner, extremely soft, short, copious, and of a light yellowish-

grey colour; the outer, very long, shining, ash-coloured at the roots, brown at the extremity, but of different degrees of intensity at different parts of the body; the middle of the back, the tail, the outer parts of the legs and the feet, being darker than the other parts; the belly lighter and greyer: the throat is white; in one instance we have seen it of a light yellowish tinge: the inner surface and margin of the ears are also whitish.

Dimensions of Beech Marten, as given by Blasius:—

	Inch.	Lines.
Total length	26	0
Length of body	17	0
„ head	3	8
„ tail	9	0
„ ear	1	6
Between eye and snout	1	3·5
Between eye and ear	1	1
Opening of the eye	0	5·4
Upper arm	2	4
Lower arm	2	5
Fore-foot, with nail	2	1 + 5'''
Thigh	2	10
Leg	3	1
Hind-foot, with nail	3	2 + 4'''



CARNIVORA.

MUSTELADÆ.



PINE MARTEN.

Martes abietum.

Specific Character.—Rich brown ; throat yellow ; under-fur yellowish-grey. The third upper grinder concave on its outer margin ; the fifth simply rounded externally.

Mustela martes, LINN. Syst. Nat. I. p. 67. DESMAR. Mammal. p. 181, sp. 280. JENYNS, Brit. Vert. p. 11. BLASIUS, Säugeth. p. 213.

Martes abietum, RAY, Syn. Quad. 200. FLEM. Brit. An. p. 14.

La Marte, BUFFON, Hist. Nat. VII. p. 190, t. xxii.

Pine Marten, PENN. Brit. Zool. I. p. 94. SHAW, Gen. Zool. I. p. 410.

WE have already described the principal characters by which the two species of Martens are distinguished, the most obvious of which are those of colour. But as these are always associated with certain tangible diversities in size and proportion, and as the habits of the two animals also offer considerable variation, there appears to be satisfactory ground for considering them as specifically distinct. The Pine Marten is so called from its preference for the

forests of those trees, as the former is called by some the Beech Marten, from a similar supposed preference for beech woods. There is, however, scarcely sufficient ground for the exclusive appropriation of the two species to these different localities. The Pine Marten is certainly attached to pine forests; but it is because the pine forests are abundant in those places which, for climate as well as for the production of its food, are most suited to its wants and habits.

Although probably existing in greater numbers than the other in this country, it is less frequently trapped or shot, which arises from its retiring to more remote and unfrequented places, such as the depths of forests, shunning the neighbourhood of man. It is equally agile, equally destructive to birds and the smaller animals, and still more timid and wild. All the Martens which we have ourselves met with in Scotland have been of this species.

The female makes her nest of moss and leaves in the hollow trunks of trees, or usurps that of the Squirrel or the Woodpecker. The number of young ones at a birth is stated to be usually but two or three.

The principal structural differences between them have been already adverted to. The fur in the present species is much more abundant, of a finer and softer texture, and of a much richer colour; and is consequently more highly valued, though it is not nearly equal to that of the Sable.

In the essay which we have quoted before, by Mr. Bennett, on the comparison of the Beech and Pine Martens and the Sable, that gentleman showed, with his usual acumen and extensive knowledge, the difficulties which exist in separating the Sable from the present species. The colour of the fur is scarcely a tangible or satisfactory distinction, for different individuals of the former species vary quite as much in this respect as the Pine Marten and

the Sable: the existence of fur on the toes, which has been adduced as a character of the Sable, probably depends on climate, and it is mentioned by Pennant as having been observed by him in the Common Marten. Never having seen an undoubted whole specimen of the true Sable, we are unable to offer any satisfactory addition to our knowledge on the more important characters of the two animals; but we have found, in the examination of numbers of the finest Sable skins, that the yellow patch on the throat had always an irregular outline, and that there were also small spots of the same fine colour scattered on the sides of the neck. This is a distribution of the colour which we have never observed either on the Common or Pine Marten. We offer the fact, however, merely as one which, combined with other characters, may possibly aid in determining the question when we have fuller information on the subject.

Dimensions of the Pine Marten, as given by Blasius:—

	In.	Lines.
Total length	27	0
Length of body	17	6
,, of head	3	10
,, of tail	9	0
,, of ear	1	8
Between eyes and snout	1	4.2
,, eyes and ear	1	1.5
Opening of the eye	5	6
Length of upper arm	2	7
,, of lower arm	2	8
Fore-foot, with nail	2	2 + 5.5
Thigh	3	1
Leg	3	5
Hind-foot, with nail	3	6 + 5

Genus, *Felis*.

CAT.

Generic Character.—Grinding teeth $\frac{4.4}{3.3}$. No tubercular grinder in the lower jaw ; tongue armed with recurved horny papillæ ; claws retractile.

WILD CAT.

Felis catus. Linn.

Specific Character.—Yellowish grey, with a dark longitudinal stripe along the back, and numerous obscure transverse stripes on the sides ; tail of equal thickness throughout, less than half the length of the head and body, grey, annulated and tipped with black.

Felis catus, LINN. Fn. Succ. 9. —Syst. Nat. I. p. 62. 6. DESMAR. Mamm. p. 232, sp. 366. TEMM. Monogr. p. 126. FLEM. Brit. An. p. 15. JENYNS, Brit. Vert. p. 14. BLAS. Säugeth. Deutsch. p. 162, fig. 101.

Felis sylvatica, MERRETT, Pin. p. 169.

Chat sauvage, BUFFON, Hist. Nat. VI. t. i.

Wild Cat, PENNANT, Brit. Quad. I. p. 81.

Common Wild Cat, JARDINE, Felineæ, p. 248, t. xxix.

It is impossible to take even the most casual view of the form and structure of the family to which the present

animal belongs, without recognizing at once their perfect adaptation to the strongest carnivorous habits. The lithe and agile body; the light, yet powerful limbs; the retractility of the claws; the firm fibre of the muscles; the short jaws, restricted to a simple vertical motion, and furnished with few, but strong and trenchant teeth; offer altogether a combination of characters, all tending to fit these animals for the pursuit and destruction of living prey, to a degree which points them out as constituting the typical group in that division of the mammiferous quadrupeds, which are nourished by animal food. Even the Weasels, sanguinary as they are, and with a conformation fitted for the capture and destruction of the smaller animals, yet exhibit in the general structure of the organs of motion—in the number, strength, and form of their teeth, and in many other particulars, a deviation from the type, a weakness and indecision in their zoological characters, which place them below the Cats in the intensity and force of their carnivorous propensity. If the perfection of organization in an animal consist in the completeness of its adaptation to that animal's habits, then all the forms, innumerable and varied as they are, which crowd before us to attest the immensity and grandeur of creative wisdom, are alike perfect; but this adaptation is certainly most striking and obvious, in those prominent and typical groups which stand out as the landmarks of zoological classification,—the centres, as it were, of the complicated system of creation.

The Wild Cat is the only species of the family which is indigenous to the British Islands. In earlier times, when woods and forests covered many parts of the kingdom, which are now reclaimed and devoted to agriculture, the Wild Cat was much more generally distributed over the face of the country; but it is now almost

entirely restricted to Scotland, some of the woods in the north of England, the woody mountains of Wales, and some parts of Ireland. Their favourite places of resort are the most inaccessible mountainous woods, where they retreat not only to hollow trees, or the depth of thickets, but to concealed fissures of rocks, in which they seek their safety and repose, and bring forth and rear their young.

In stating the localities and estimating the numbers of this species, it is necessary to guard against confounding with it the numerous instances of escaped Domestic Cats, returning to a state of almost absolute wildness, breeding in the woods, and feeding on birds and small quadrupeds. These, though far less powerful than the true Wild Cat, are very destructive to game of every description; and, still retaining some traces of their old domesticity, they often revisit the farmyard, and carry off the poultry.

The question whether the Domestic Cat is originally derived from this species or not has long been a disputed one. On the one hand, it must be confessed that it is impossible to point out any structural differences of importance between the animals, for Blasius's cranical characters (*Säugeth. Deutschl.*, pp. 160, 161,) prove not to be constant when a large series of skulls are compared. But it seems strange that the characteristic cylindrical and truncated tail of *F. catus* should never reappear in any of the domestic breeds. Many writers have favoured the idea that our tame Cats are descended from the Nubian *F. maniculata*, but we are not aware that a careful anatomical comparison has ever been made. On the whole, we must regard the origin of the Domestic Cat as being still an open question.

The disappearance of the Wild Cat from the districts where it was once so common, is not to be attributed ex-

clusively to the destruction of the woods which formed its resort; but rather, in many parts, to the introduction of the fowling-piece in place of the primitive means of destruction known to our forefathers: for, although it was formerly considered a beast of chase, yet the great facility with which it climbs trees, and could thus escape from the pursuit of the Dogs, must have much restricted the extent of its destruction; but in the present day, when such shifts will no longer avail, it falls so surely before the gun of the gamekeeper or the forester, as to threaten its extermination at no very remote period.

The strength and fierceness of this species are such as to render it an adventure of no trifling annoyance, and even of some danger, to come into close quarters with it, especially when exasperated by a wound. It is no pleasant affair to encounter an enraged male Cat even of the domestic race; the strength and sharpness of his claws, and the length and power of his canine teeth, combined with a fierceness and rage which render such weapons doubly formidable, constitute him an opponent of no ordinary importance: but the Wild Cat is still more to be dreaded, from the greater size, power, and ferocity by which it is characterized. Hence Pennant designates it as the "British Tiger."

The female is considerably smaller than the male. She forms her nest either in hollow trees, or more commonly and more safely in the clefts of rocks; and has even been known, as Sir William Jardine says, to usurp the nest of some large bird as her own. She usually brings four or five young.

The Wild Cat is found throughout the whole of those countries of Europe in which extensive forests exist, especially in Germany, and in all the wooded climates of Russia, Hungary, and of the north of Asia; these are of

larger size, and their fur is longer and held in much higher estimation than that of those inhabiting warmer latitudes.

The head of the Wild Cat is triangular, strongly marked; the ears rather large, long, triangular, and pointed; the body strong, and rather more robust than that of the Domestic Cat; the tail of equal size throughout its length, or rather larger towards the extremity. The fur is soft, long, and thick; the colour of the face is a yellowish-grey, and a band of black spots towards the muzzle; the whiskers are yellowish-white; forehead brown; the head grey, marked with two black stripes passing from the eyes, over and behind the ears; back, sides, and limbs grey, darker on the back, paler on the sides; with a blackish longitudinal stripe along the middle of the back, and numerous paler curved ones on the sides, which are darker towards the back, and become obsolete towards the belly, which is nearly white. The tail is annulated with light grey and black, and the tip is of the latter colour; the feet and insides of the legs are yellowish-grey; the soles of the feet are black, at least in the male, of which sex Temminck declares it to be a peculiarity: the colours of the female are altogether paler, and the markings less distinct.

The dimensions of the Wild Cat differ greatly, if we take the statement of various naturalists. The medium size of the full-grown male is as follows; the female being always rather smaller:—

	Feet. In. Lines.			
Length of the head and body	1	10	0	
„ of the head	0	3	8	
„ of the ears	0	2	3	
„ of the tail	0	11	2	

CARNIVORA.

CANIDÆ

Genus, *Vulpes*.

Generic Character.—Grinding teeth $\frac{2}{2}:\frac{2}{2}$; tongue smooth: claws not retractile: pupil, when contracted, elliptical; tail bushy.

COMMON FOX.

Scotticè, TOD.*Vulpes vulgaris*. (Briss.)

Specific Character.—Reddish-brown above, white beneath: behind the ears black; the tip of the tail white.

Canis vulpes, LINN. Syst. Nat. edit. XII. I. p. 59. MULLER, Zool.

Dan. Prod. p. 2. DESMAR. Mammal. p. 201, sp. 304.

FR. CUVIER, Diet. des Sc. Nat. VIII. p. 561. JENYNS,

Brit. Vert. p. 14. BLAS. Wirbelth. Deutsch. I. 191.

Canis melanogaster, BONAP. Icon. Faun. Ital. fasc. I. f. 1.

Vulpes vulgaris, BRISSON, Roy. Anim. p. 239, 5. FLEM. Brit. An. p. 13.

Le Renard, BUFFON, Hist. Nat. VII. p. 57, t. iv.

Fox, PENNANT, Brit. Zool. I. p. 71. SHAW, Gen. Zool. I.

p. 314.

THE FOX has been celebrated from the earliest anti-

quity for the cunning and ingenuity which it manifests, whether in obtaining food or in eluding pursuit. The general expression of its features, the obliquity and quickness of the eye, the sharp, shrewd-looking muzzle, and the erect ears, afford the most unequivocal indications of that mingled acuteness and fraud which have long rendered it a byword and a proverb; for it is well known that this character of its physiognomy is not falsified by the animal's real propensities and habits.

The Fox spends much of his time in burrows; either excavating them for himself, or seizing upon and appropriating the preoccupied habitations of some other fossorial animal, as the Badger or the Rabbit. In this retreat, which in sportsman's language is called its earth, it remains concealed during the day, and comes abroad only in the night in search of its food. Its instinctive cunning leads it soon to suspect the wiles of its enemies; and it will in a very short time ascertain the design of a trap or a gin, though concealed with the utmost care. It is credibly stated by a French writer, that a Fox has been known to remain within its retreat without food for fifteen days, rather than risk the danger of falling into the traps, which its sagacity had ascertained to be set around it.

It does not, however, by any means live exclusively in burrows, but, as every lover of the hunt is well aware, is commonly found in woods, and affects certain covers in which to repose during the day, in preference to others where the lying, as it is termed, is not so good. Woods having a northern aspect are said to be unfavourable for Foxes. But the Fox does not altogether disdain the open country, being often found lying upon stubble-cocks, or on a grassy hedge-bank, from which places it is sometimes roused by the courser, the mettle

of his greyhounds being often, on such occasions, put to a severe test. We have also seen Foxes taken in old straw or stubble-ricks, near unfrequented farmsteads; and have even known the female breed and rear her young ones in such a place. But these haunts are not usual, the Foxes which frequent them being reputed by foxhunters old individuals which have retired to quiet country quarters, and as being possessed of more than ordinary cunning.

Our late kind friend and correspondent Mr. Hogg, to whom we have been indebted for much interesting information on the habits of many of our indigenous animals, writes thus:—"I remember once when out hunting, the Hounds found a Fox who did not leave the cover, but kept running from one part of it to another. Just as a Hound was about to seize him, he jumped over the Dog, and thus saved himself. This tedious sport was kept up for a long time, till Reynard being thoroughly tired with so many leaps and so many enemies, at last fell a prey to them. The huntsman on taking him up found that he had lost one of his forelegs. The cover being entirely of furze, and not large, I could see all sides of him during this hunt, and was much pleased with the many elegant and quick leaps which the poor three-legged Fox made to save himself from destruction.

"The young are very active; and I have seen them occasionally at play on a summer's evening, jumping over their dam and each other, and running after their brushes. They have a short stifled bark." Mr. James states, "We have ourselves observed the playfulness of young Foxes, and may here observe that they can be watched without giving them the least alarm, if the observer be elevated only a few feet from the ground. Seated in the top of a pollard ash, we have watched for an hour at a time,

without exciting the least suspicion, several half-grown Foxes, although they were continually within a few feet of us,"

Its usual prey consists of hares, rabbits, various kinds of ground birds, particularly partridges, of which it destroys great numbers; and it often makes its way into the farmyard, committing sad havoc amongst the poultry. It has been known not unfrequently to carry off a young lamb. In default of this its favourite food, it has recourse to "rats and mice, and such small deer"—or even to frogs or worms. We have heard from a man much engaged in woods, that the Fox gives the preference to putrid meat. The remark was elicited by observing the skin of a Hedgehog turned inside out, which was at once claimed by the woodman as the work of a Fox. We are much disposed to accord with this opinion, having often observed that Hedgehogs which have been taken in traps are, after a time, devoured by some animal of sufficient size to turn the skin inside outwards. As Badgers do not occur where this has been observed, and Dogs and Cats will not feed on the Hedgehog, it must be attributed either to the Fox or to magpies and crows. As a further evidence of the proneness of the Fox for high meat, we may mention having seen the remains of several rooks and a magpie taken from the nest of a Fox, all of which had been trussed and hung up in a cornfield as scarecrows, and had become quite putrid. The Fox also resorts to the sea-shore, in search of such fish, mollusca, crustacea, and other marine animals as the tide has left upon the beach. Besides the kinds of food above mentioned, there is no doubt but that coleoptera are consumed in great numbers. We have often seen a Fox searching for and picking up something of small size, which we could not doubt consisted of

insects; and the droppings of these animals are often composed almost entirely of the wing-cases of beetles.

The Fox can scarcely be said to be susceptible of attachment or capable of being tamed. The utmost degree of domestication to which it can be reduced, is to suffer the person who has fed and brought it up to handle it without much danger of being bitten; but it is wholly devoid of that instinct of gratitude and kindness which characterize its congeners—the Dog, and even the Wolf and Jackal. Although taken young, or even born in captivity, and brought up in company with domestic Dogs, it still remains suspicious, sly, and timid, retreating from every attempt at familiarity, and scarcely distinguishing its companions by any mark of recognition.

It has often been asserted that the Fox and the Dog will breed together. The experiments of Buffon certainly failed, and we have in vain endeavoured to trace any valid ground for this general belief. This refusal to intermix with the Dog evinces a far more remote affinity to that animal than either the Wolf or the Jackal, with both of which the experiment has often been successfully made. The female Fox loses all her timidity and shyness when suckling her young, in whose defence she exhibits a degree of courage and boldness which are very foreign to her general habits and disposition. The time of gestation is not perhaps accurately ascertained, but is certainly between sixty and sixty-five days. The young are born in April, and are a year and a half in attaining their full size. The Fox is said to live thirteen or fourteen years; but as this can only have been ascertained of individuals in confinement, it is exceedingly probable that in a state of nature it considerably exceeds this period.

Its resemblance to the Dog, the Wolf, and the Jackal can scarcely be considered as sufficient to constitute it a

species of the same generic group. The general form of the body, and particularly the sharp elongated muzzle, the elliptical pupil, and the full bushy tail—all of them characteristic of every species of Fox—do not belong to any of the true Dogs: we cannot, therefore, but consider them as generically distinct. We may mention, as further argument in support of the generic separation of *Vulpes* from *Canis*, that the species of the former group retain, although geographically separated, the same Fox-like aspect and behaviour which we have attributed to our English species.

There is a general opinion amongst sportsmen that we have more than one species of Fox, and we have even heard this opinion warmly contended for. It is of course needless for us to state that this is an error, and that the so-called species which are severally denominated the Greyhound, the Mountain, and the Bush or Cur Foxes, are but varieties of the common species. We confess ourselves, however, unable to explain whether these varieties are due to locality, age, or sex.

The figure of the Fox is sligher than that of the Wolf; but it has less of ease and suppleness in its movements. The muzzle is elongated, becoming very pointed towards the apex; the head round; the ears erect and triangular; the eyes oblique, and the pupils elliptical or nearly linear when exposed to the light of day, becoming round, or nearly so, only in the dark; the body is much elongated, and the limbs short in proportion; the tail is large, thick and bushy, and so long that when pendant it touches the ground. The colour, though principally fulvous, is a combination of that colour with black and white, distributed in various proportions on different parts of the body. The fulvous colour predominates on the head, the back, the sides, the posterior parts of the limbs, and the sides

of the tail. The shoulders are reddish-grey ; the throat and chest are grey ; the belly, the internal surface of the limbs, the cheeks, the upper lip, and the extremity of the tail are white ; there is a black line extending from the inner angle of the eye to the mouth ; and the external surface of the ears, excepting the base, and the anterior part of the limbs, are of the same colour.

The late Prince Charles Lucien Buonaparte described, in his *Fauna Italica*, a Fox which differs from the common one in having the fur of the belly black. From this character the Prince gave it the specific name of *melanogaster*. The opinion expressed in the former edition of this work, that this might be nothing more than a variety of the common species, has been entertained also, in his subsequently published work on the Mammals of Germany, by Professor Blasius ; and an individual taken in Warwickshire had all the under parts of a greyish-black hue. Being scarcely full grown, it is probable that with age the dark parts would have assumed their ordinary colour ; and there is little doubt that it was an animal resembling this one which was described as *Canis melanogaster*. The Common Fox is sometimes seen in this country with the tip of the tail black or dark grey : Mr. Ogilvy has suggested that this may arise from the unusual length of the black hairs of this part, which are generally quite concealed by the long white hair ; and both this gentleman and Mr. Blyth state that cubs of the same litter differ in this respect ; a proof of how little value are such circumstances as distinctive characters.

The Fox has a sub-caudal gland which secretes an extremely fetid substance ; and its urine also possesses the same intolerable odour. The Fox varies considerably in size, and perhaps a little in form. It is larger and stronger in some parts of the country than in others ; but, as

already observed, these variations appear to be accidental, and not to merit the distinctions which have been applied to them.

Dimensions:—

	Ft.	In.	Lines.		Ft.	In.	Lines.
Length of the head and body .	2	3	0	to	3	10	0
,, of the tail	1	0	0	,,	1	3	0
,, of the head	0	6	0	,,	0	6	6
,, of the ears	0	3	6	,,	0	3	9
Height of the shoulders, about					1	2	3



CARNIVORA.

PINNIPEDIA.

Sub-Order CARNIVORA PINNIPEDIA.

SEALS.

THERE are few groups among the whole of the mammiferous class which are so indistinctly known, or of which the species are so often confounded, as the Seals and their allies. The great general similarity of their form and habits has occasioned the confusion of distinct species under one name, while, on the other hand, their great variation in colour and markings, whether accidental or connected with differences of age or sex, has often led to the enumeration of species which do not exist in reality. Under these circumstances, it is evident that structural differences alone can be depended on in the discrimination of these animals, and the characters of the skull and of the teeth will generally be found most available for this purpose, aided by the outward proportions and other circumstances. The characters of the northern Seals have been greatly elucidated by the labours of De Blainville, of George and Frederick Cuvier, and of Lilljeborg, Nilsson, and Gray, but comparatively little has been done since the publication of our first edition in the determination of the species which occur on the British coasts, and considerable uncertainty still remains to be cleared up by future observers.

The true Seals, or *Phocidæ*, along with the Walrus (*Trichecus*) and Eared Seals (*Otaridæ*) constitute a very

natural and well-marked sub-order of the Carnivora—the *Pinnipedia* of Illiger. They differ in many striking characters from the families which we have already considered, and it is highly interesting to observe the various modifications of structure which combine to fit them for their peculiar mode of life. The Bat in its aerial flight, the Mole in its subterranean excavations, and the Stag in his swift terrestrial course, do not exhibit more perfect instances of the adaptation of form and structure to habits than do these animals in their amphibious existence.

As already indicated, this group or sub-order may be divided into three well-defined families, of which two are represented in our fauna. Of these the first is that of the typical Seals (*Phocide*), of which the common *Ph. vitulina* of our coasts may be taken as the type. Here we have all the modifications of structure characteristic of the group in their highest development. The rounded head, the absence of an external ear, the tapered almost spindle-form body, and the close-lying outer hair, present no obstacle to a rapid passage through the water, while the thick soft wool which closely covers the skin prevents sudden changes of temperature, and retains the heat of the body. A thick layer of subcutaneous fat not only assists in promoting the last object, but also renders the whole animal lighter, and brings it nearer to the specific gravity of the fluid in which it passes so much of its time. The eyes are large and brilliant, and the nostrils are capable of being entirely closed. The ears are inconspicuous openings, totally devoid of any exterior conch, but provided with a minute triangular valve which just closes the orifice when submerged. The whiskers are very stiff and thick, and appear to be of some importance as organs of

touch, the root of each bristle, as in the land Carnivora, being provided with a considerable nerve.

The teeth are of the usual type of the order, specially modified for the purpose of seizing the scaly and slippery fish on which the Seal feeds. The canines are strong and acute, the molars beset with pointed tubercles of various forms, but all adapted to a piscivorous diet; in the genus *Halicharus* those of the upper jaw are remarkable for their simple and conical form. In the seals the first or milk-teeth are merely rudimentary, and are absorbed without cutting the gum, usually during fœtal life; at the age of a week, according to Prof. Flower, scarcely a trace of them remains. The tongue is smooth, and slightly notched at the tip, and the gullet is very dilatile. The stomach is simple in its character, the intestine is very long, and is provided with a cœcum, and the liver is remarkable for the great enlargement of the inferior *vena cava*.

The whole skeleton is constructed on the same plan as that of the other Carnivora. In the skull, the brain-case is very broad and flattened, and the portion between the orbits is much compressed. The internal bones of the nostrils are extremely large and complicated, and the division between them is well-developed, extending forward in one genus (*Cystophora*) even in front of the nasal bones.

But perhaps the most striking peculiarity of the Seal lies in the position and functions of the limbs, which are not fitted to raise the body from the ground, and are almost exclusively used in aquatic progression. Both the fore and hind limbs are enclosed in the common integument as far as the wrist and ankle-joints, and the toes are connected together by complete webs. The hind feet are extended backwards in the line of the

body on either side of the short tail, the soles of the feet being opposed, and their dorsal surfaces consequently turned outward. The result of this structure on the motions of the animal are very striking. On dry land, a Seal usually makes no use whatever of its limbs; resting on its belly, it throws itself forward by the action of the pectoral and abdominal muscles in a series of most ludicrous spasmodic plunges or bounds, but as will be seen hereafter, the fore-feet are sometimes called into play by some species to drag the body forward. In the water the hind limbs *only* are used as propellers, the flippers being only used to balance the body or to change its position; as Prof. Huxley remarks, "the fore limbs are applied against the sides of the thorax, and the hinder moiety of the body being very flexible, the conjoined hind limbs and tail are put to the same use as the caudal fin of a cetacean." For a more detailed account of the motions of Seals on land and in the water, we may refer our readers to a paper on the mechanism of flight and swimming, by Dr. J. B. Pettigrew, in Vol. XXVI. of the "Transactions of the Linnæan Society," and to one on *Ph. grænelandica*, by our friend Dr. Murie, in the Zoological Society's "Proceedings" for 1870.

The second family (*Trichechidæ*) of the sub-order consists, as far as is known, of a single genus and species, distinguished by the enormous developement of the canine teeth in the adult. The Walrus is a native of the Arctic regions, and only visits our coasts as an accidental straggler. In many respects it may be regarded as intermediate between the *Phocidæ* and *Otaridæ*, particularly in its quadrupedal gait and in its manner of swimming, but these and other points in its history will be considered hereafter.

The third family (*Otaridæ*) is distinguished by the

possession of external ear-conches. The Sea-Bears and Sea-Lions walk erect like the Walrus, and differ from the true Seals in many points of their anatomy. They are mostly natives of the South Seas and the Pacific Ocean, and none of them are members of the European fauna.

On the British coasts Seals are hardly plentiful enough to be of more than local importance as objects of pursuit, though large numbers are annually killed in some parts of Scotland and Ireland. But it is very different in the far north, where vast herds of *Ph. grælandica*, *Ph. barbata*, and *Cystophora cristata* assemble in spring on the ice of the Greenland and Spitzbergen seas, as well as in Davis's Straits and around Newfoundland. Every spring a large fleet of European vessels sails northwards and coasts along the southern margin of the ice-fields, till the Seals are met with, when the hunters endeavour to cut off their retreat to the open water, and then despatch them with heavy clubs. The numbers thus destroyed are very great; Dr. R. Brown estimates the value of those killed in the Greenland seas alone at about £116,000 (Proc. Zool. Soc., 1868, p. 604). It appears inevitable, as Dr. Brown remarks, that such indiscriminate slaughter must soon greatly diminish the numbers of the northern Seals, and eventually destroy the value of the "fishery." But if the Seal is thus an object of value to civilized man, it is still more so to the native Greenlander and Eskimo, to whom it affords many of the necessities of life. Its flesh is their principal food, the fat yields oil for their lamps, the skin affords excellent clothing, while of the semi-transparent membrane of the intestine they make bottles for storing the oil, windows for their huts, and even shirts.

The word Seal is certainly from the Anglo-Saxon

Selc, *Seolc*, which remains almost unchanged in the Scotch "Sealch."

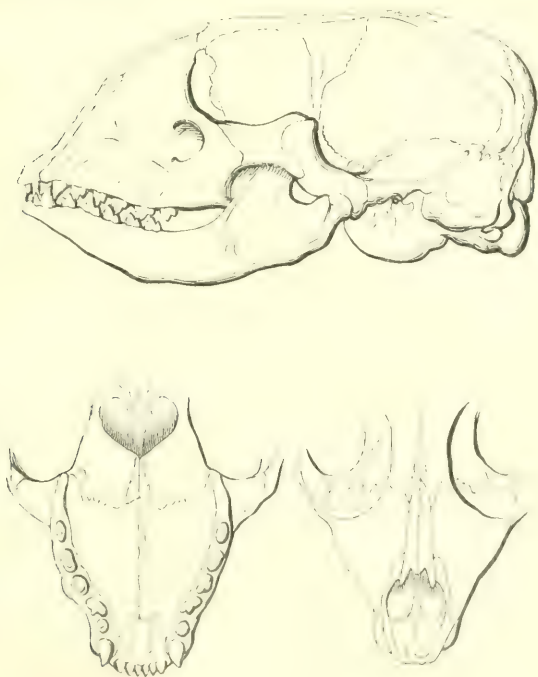
It appears highly probable that the myths of antiquity were indebted to this group of animals for the form of some of their fabled deities, particularly of the Tritons. The rounded head with its strangely human expression, the hand-like fore-feet and the conformation of the fin-like hind limbs, so closely resembling the tail of a fish, might easily suggest the idea of a being who was man above and fish below. Still more probable is it that the Mermaid of our own superstitions originated in the appearance of some species of Seal in an unwonted locality, a circumstance sufficient in the olden time to give rise to a far more egregious violation of truth than the conversion of the animal into a sea-maiden. The only other creature which can have a claim to be regarded as the origin of this world-wide myth is the Manatee, a point which will be alluded to hereafter. We learn from Suetonius and Pliny that the skin of the Seal—*vitulus marinus*—was believed by the Romans, and among them by the Emperor Augustus, to be a protection against lightning.

In our first edition we enumerated five species of this group, namely, *Phoca vitulina*, *Ph. grænlandica*, *Ph. barbata*, *Halichærus gryphus*, and *Trichechus rosmarus*. Of these we have resolved to omit *Ph. barbata*, for which the Gray Seal has often been mistaken, and of whose occurrence on our shores there is no good evidence.* In

* It is true that the late Mr. Macgillivray speaks of a Scotch specimen in the Edinburgh University Museum (*Naturalist's Library*, Vol. XVII., p. 112), but no trace of it can be found by our friend Prof. Turner, who has kindly sought for it in the Museum of Science and Art, to which the University collection was transferred in 1854, nor is anything said by Macgillivray of its history. It seems probable that there was some mistake, either in the identification of the species, or as to the locality whence it was procured.

case, however, that it may yet visit these islands, we give a figure of its skull as a vignette to the present article. This species may be readily recognized by its very dark colour, its great size, and the form of its fore-feet, of which the *third* toe is the longest; the frontal portion of the skull is much arched, as shown in the figure, and the nasal bones are depressed in front, instead of being nearly horizontal as in the other species.

We have retained *Ph. granlandica* in our list, though with much doubt, and have added two other species which have been recorded since the date of our first edition, namely, *Ph. hispida* and *Cystophora cristata*.



CARNIVORA
PINNIPEDIA.

PHOCIDÆ.



Genus PHOCA (Linnæus, 1766).

Generic Character.—Head rounded, muzzle bald, brain-case of skull large. Teeth, inc. $\frac{1}{2}$, can. $\frac{1}{2}$, grinders $\frac{2}{3}$, tuberculated, the first with one root, the rest with two.

COMMON SEAL.

Phoca vitulina (Linnæus).

Specific Character.—Spotted above with grey and black, whitish below. Ascending processes of intermaxillaries truncated, not reaching the nasals or touching them at one point only; bony palate acutely notched behind, posterior palatine foramina opening on maxillæ. Molars crowded, placed obliquely. Length of adult from three to five feet.

Phoca vitulina. LINNÆUS, Syst. Nat. I. 56 (1766).

„ *variegata*. NILSSON, Skand. Fauna (1820).

Calocephalus vitulinus. F. CUVIER, Dict. Sc. Nat. XXXIX, 544 (1826).

Tang-fish (*Shetland*); Rawn (*Hebrides*); Sealch, Selkie (*Scotland*), Sea-dog, Sea-calf, and Sea-cat (*of Sailors*).

THE distinguishing characteristics of this, the commonest European species of Seal, are at length well determined. Of these, the oblique position of the

molar-teeth, by which the inner posterior margin of one is brought in contact with the outer anterior margin of the next behind it, was pointed out in our first edition as being not less striking than distinctive. Since then Mr. Ball has expressed the opinion that this character is not to be depended upon, it being a mark of youth and disappearing "long before the skull attains its maximum size" (*Trans. Roy. Irish Ac.*, v. VIII.); but we still believe that it will be found to be characteristic at all ages, although it is certainly more marked in young than in very old animals. In the structure of the skull, also, well-marked features will be found, of which we may mention the following:—The posterior margin of the palatal bones is deeply and acutely notched, affording a good character to distinguish the skull from that of *Ph. barbata* and *Ph. grænlandica*; and the posterior palatine foramina are situated on the maxillæ, and not on the palatines or on the suture as in *Ph. hispida*. Another striking peculiarity is in the form of the intermaxillary bones, the ascending processes of which do not run up to a point along the outer margin of the nasals, as in the other members of the genus, but are truncated above, and either do not touch the nasals at all, or are in contact with them at one point only. These characters we believe to be quite constant, and they will be easily understood by a comparison of our figures of the skulls of the various species. In external form and markings, it would be difficult to point out definitely any one peculiarity by which this species could be unhesitatingly separated from its nearest allies.

The Common Seal is strictly littoral in its habits, frequenting the coasts of both sides of the North Atlantic, but avoiding the ice of the open sea. It is common in Spitzbergen, Greenland, and Davis Straits:

in Greenland many are annually killed, the average yearly capture of this and the next species in the Danish settlements amounting, according to Dr. R. Brown, to upwards of seven hundred thousand. It is also abundant on the shores of Northern Russia, Scandinavia, Holland, and France, but is rare in the Baltic. It is said to occur occasionally in the Mediterranean, but the common species in that sea is the Monk Seal (*Ph. monachus*). The Seal found in the Caspian Sea was regarded by Pallas as a variety of *Ph. vitulina*, but has been separated by Nilsson as *Ph. caspica*, and is considered by him to be more nearly allied to the next species; it is still very imperfectly known.

In our own islands the Common Seal is found all round the coast in suitable places, but is much less abundant than it formerly was, and has been quite banished from many places where it was formerly well known. It is common on many parts of the Irish coast, and is very abundant among the Scotch islands, especially in Shetland and Orkney. In Wales and Cornwall it is well known, but it is now very rarely seen on the shores of the southern and eastern counties of England.

The habits of this species are not markedly different from those of the rest of the genus. As already observed, it is essentially a coast-loving species, not extending its range to the ice-fields of the open sea, and it is particularly fond of sheltered sounds and bays, where the water is not very deep, and fish are plentiful. An excellent account of its manners, as observed in the Hebrides, was given by the late Mr. J. Wilson in the first volume of the "Magazine of Zoology and Botany." He observes that the Seals leave the water every tide, usually selecting low shelving rocks for a resting-place, and almost invariably such as are separated from the

mainland. Here they usually remain, if undisturbed, for about six hours. "They lie together so close as to appear to be almost in contact, to the number sometimes of one, two, or three dozen. With their heads constantly turned to the sea, and seldom more than a yard or two from it, they seem to enjoy a pleasing repose on *terra firma*, their appetites appeased by previous fishing, and a feeling of comfort or satisfaction produced upon their moistened surface by the genial rays of an invigorating sun. But even in this their hour of rest, their customary caution never leaves them, for one of their number is placed a little higher up the rock than the others, and he seems constantly awake, and ever and anon raises his grim features, scenting the windward air." When undisturbed they frequently utter a grunting sound, like pigs.

We have already alluded, in our general account of the family, to the peculiar way in which the true Seals move on land. This is very well marked in the present species, and must be familiar to most visitors to the gardens of the Zoological Society, where its quaint and graceful movements in the water may also be well observed, and especially its habits of swimming on its back and of twisting itself in cork-screw fashion in the water. Ludicrous as is its gait on land, a Seal can get along on the level at a good round pace, and Mr. Ball mentions that one which escaped from captivity during the night had passed over rough ground to a distance of at least a mile and a half before it was recaptured. In the water a Seal is perfectly at home, and Dr. Brown believes that it can even sleep when afloat: "I have frequently been assured," he says, "by old Seal-hunters that Seals can sleep on their back, while floating in the sea, and this statement corroborates that of Fabricius and other naturalists. In 1861, in Davis Straits, the

steamer in which I was ran against a Seal sleeping in this manner."

In the quaint language of Low, in his "*Fauna Orca-densis*," "Seals seem to have a great deal of curiosity: if people are passing in boats they often come quite close up to the boats and stare at them, following for a long time together: if people are speaking loud, they seem to wonder what may be the matter. The church of Hoy, in Orkney, is situated near a small sandy bay much frequented by these creatures; and I observed when the bell rang for divine service all the Seals within hearing, swam directly for the shore, and kept looking about them as if surprised, rather than frightened, and in this manner continued to wonder so long as the bell rang." The fondness of these animals for music has been often noticed, and did not escape the attention of Sir Walter Scott, who tells us how—

" Rude Heiskar's Seals through surges dark
Will long pursue the minstrel's bark."

In the "*Naturalists' Library*," it is stated that Seals may easily be attracted by playing on a flute, and Scoresby says that whistling will often bring them to the surface.

The promise of intelligence and docility given by the highly developed brain and mild demeanour of the true Seals, is not belied by their conduct in captivity. There are many records of the extent to which they may be rendered obedient to the commands of their master, to whom they often exhibit a very warm attachment. Frederic Cuvier mentions one which would rise on its hind feet, shoulder a stick as a musket, lie down on the right or left side, and perform many other tricks. The so-called "*Talking Fish*" which were exhibited in this country some years ago, were merely well-trained Seals.

The docility of this animal is no new discovery, the ancients were well acquainted with this trait in its character, and Pliny in particular has the following passage :—"Accipiunt disciplinam, voceque pariter et visu populo salutant, incondito fremitu: nomine vocati respondent."

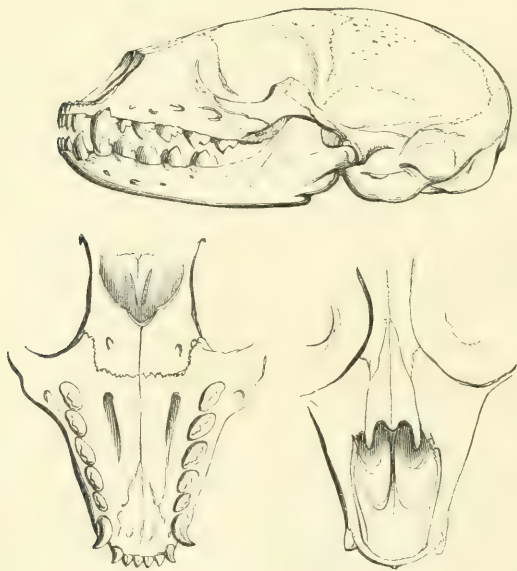
The food of this species consists entirely of various fish; Mr. Wilson observes that it is especially fond of flounders, which indeed form its principal food in the Hebrides. It is also a great foe of the salmon, which it follows up rivers to a considerable distance.

The Common Seal pairs in September, and a single young one—or sometimes two—is born about the month of June. An account of the birth of a young Common Seal in the Zoological Society's Gardens is given by Mr. Bartlett in the "Proceedings" for 1868 under the name of *Ph. fætida*, the parents having at first been wrongly identified (*Cf. P. Z. S.*, 1871, p. 701). The cub was at first clad in a loose coat of outer fur and hair, but in a few minutes after birth it completely divested itself of this covering, which formed a sort of mat on which it lay for the first hour or so. It would appear that in *Ph. vitulina* this woolly coat is always shed either before birth or immediately after; in some species it is retained much longer. Mr. Bartlett adds that this young Seal was swimming and diving within three hours of its birth, that it had a single call-note—a low soft *ba*—and that its mother turned on her side to suckle it.

The skin and oil of the Seal are valuable, and the flesh was formerly much appreciated, especially during the fasts of the Roman Catholic Church, when it was regarded as fish. In Orkney the limbs used to be cured as hams, and in Greenland this species is especially valued as affording the best of all "Seal-beef."

The body of the Common Seal is elongated, conical, tapered from the chest to the tail; the head rounded, flattened: the upper lip thick and mobile, furnished with strong undulated whiskers. The muzzle is rather short; ears marked only by a small triangular lobe at the anterior margin of the orifice; eyes placed nearer to the ears than to the muzzle, limbs very short, the claws longer on the hind than on the fore paws. The hair is stiff and shining, concealing a short soft undercoat of woolly fur. The general colour is yellowish-grey, with spots of black and brown, which unite on the back and sides, so as to form a dark mottled grey; the lower parts are silvery.

The adult animal attains a length of from three to five feet, of which the head occupies from six to eight inches.



CARNIVORA.
PINNIPEDIA.

PHOCIDÆ.



RINGED OR MARBLED SEAL.

Phoca hispida (Schreber).

Specific Character.—Blackish grey above, marked with oval whitish rings; whitish below. Hair soft, sub-erect. Ascending processes of intermaxillaries running to a point up the sides of the nasals; bony palate acutely notched behind; posterior palatine foramina opening on or behind the palato-maxillary suture. Grinders placed in a straight line, not oblique. Usual length three to four feet.

<i>Phoca hispida</i> ,	SCHREBER, Säugethiere, III. 312 (<i>before</i> 1778).
„ <i>fatida</i> ,	FABRICIUS, in Müller's Prod. Zool. Dan. p. VIII. (<i>not described</i>) 1776.
„ <i>annellata</i> ,	NILSSON, Skand. Fauna (1820).
<i>Calocephalus discolor</i> ,	F. CUVIER, Dict. Sc. Nat. XXXIX. 545 (1826).
<i>Pagomys fatidus</i> ,	J. E. GRAY, Proc. Zool. Soc. 1864, 31.
Neitsek of Greenlanders, Nerpa of Russians, Floe-rat of Sealers, Bodach of Hebridians?	

THE Ringed Seal, in its external features, comes very near the common species, though it may be distinguished by its constantly smaller size, and usually by the distinctly annulated character of its markings. Better points of distinction, however, are to be found in the skull and

dentition. It agrees with *Ph. vitulina* in the deep angular emargination of the bony palate, but differs in the form of the ascending processes of the intermaxillaries, which run to a point up the sides of the nasals; in the posterior palatine foramina opening on or behind the suture, instead of on the maxillary bones; and in the grinding teeth being placed in a straight line, and not obliquely.

This is a northern species, being especially abundant, according to Dr. R. Brown, between 76° and 77° north latitude. Parry met with it as far north as 82°. In Greenland it is principally met with in the north, though numbers are also killed in the southern settlements; in Davis Strait it is very plentiful among icebergs and in the great ice-fjords. Nilsson states that it is found in Lake Saimen in Finland, and in Lake Onega, and he regards the Seal of Lake Baikal as a variety of this species, differing only in its more uniform grey colour, a determination which is confirmed by Herr Radde, who figures and describes the Baikal form in his "Reise im Süden von Ost-Siberien." The Ringed Seal is found on all the Scandinavian coasts, both Atlantic and Baltic, and was traced by Nilsson as far south as the Channel, whence there are specimens in the Paris Museum.

The claims of this species to be admitted to the British Fauna rest principally on the occurrence of one specimen on the Norfolk coast in 1846, the skull of which was presented to the Norwich Museum by Mr. J. H. Gurney. This skull was sent for examination to Prof. Flower in 1871, and was identified by him as belonging to this species in the "Proceedings of the Zoological Society" for that year. According to Mr. Southwell, the Seal was bought in the flesh in a perfectly fresh condition in the fish-market of Norwich, and was stated to

have been taken on the neighbouring coast, but Mr. Gurney does not now remember the exact locality. The fur was of a grey colour, and the skull is that of a very aged animal. But although this is our only certain record of the species having been killed in Britain, there is reason to believe that it sometimes visits our coasts. In Mr. Wilson's paper on Scottish Seals in the first volume of the "Magazine of Zoology and Botany," a small and rare species is mentioned on the authority of Mr. McNeil of Colonsay as being sometimes seen in the Hebrides, where it is called by the natives *Bodach*, or "the old man." "So small is it that my informant for a long time entertained an idea (in opposition to the prevailing opinion of the natives) that it was the young of the Common Seal. This view, however, he afterwards gave up, on seeing specimens not larger than an ordinary Seal of three months, but with grey beards and decayed teeth; and, moreover, when on shore on the same rock with the other Seals, they do not lie near them, but a little way apart. They are also few in number, and Mr. McNeil does not happen to recollect having ever seen two of them together. They are not at all so shy as the Common Seal, nor do they frequent such wild and desert stations as *Tapvaist*" (the Grey Seal). Mr. Lloyd has suggested that this *Bodach* of the Hebridians must be the Ringed Seal, and from both the size and the habits mentioned this view seems more than probable. To go back to geological times, it was probably not uncommon on the shores of Britain during the glacial epoch, for our friend Prof. Turner has identified the remains of Seals found in the brick-clays of various parts of Scotland with this species; it has also been found in similar deposits in Sweden by Prof. Kinberg, along with *Ph. vitulina* and *Ph. barbata*.

According to Dr. Brown the "Floe-rat," as this species is named by the Sealers, delights in the ice of the coasts, seldom frequenting that of the open sea, and lives in retired situations at some distance from the margins of the floes. Here it keeps open its *atluk* or hole for fishing, beside which it passes much of its time in sleep. Fabricius considered it the most incautious of all the Seal tribe.

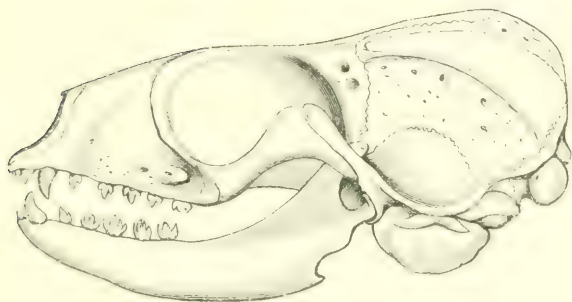
The pairing time is said to be in June, and a single young one is born on the fixed ice late in winter or very early in spring. It is at first clad in white or dirty grey woolly fur, which is retained for nearly a month. Herr Malmgren states that it will take to the water before it loses this first covering, which is not the case with the cubs of either the Greenland or the Grey Seal. The mother is much attached to her offspring, and is said to carry it away in her mouth in case of danger.

This Seal received the name of *Ph. fœtida* from Fabricius in a list of Greenland animals published in Müller's "Prodromus Zoologicæ Danicæ" in 1776, but without any description. Schreber named it *Ph. hispida* prior to 1778, and Fabricius subsequently withdrew his name in favour of Schreber's, an example which Prof. Flower considers should be followed. The name *fœtida* is derived from the strong smell of the old males. Fabricius says "Mares veteres fœtidissimis ad nauseam usque etiam Grœnlandis," but Dr. Brown regards the flesh of all, but especially of the young, as being "sufficiently palatable to an *educated* palate." The skin affords the common material for clothing in North Greenland, but is not so much valued for that purpose as that of the last species.

The general appearance is much that of the Common Seal. The upper parts are dark brownish-grey, almost black on

the back, and marked on the sides with numerous irregularly oval whitish rings; the belly is whitish, with a few dark spots, and the region round the eye is uniform in colour. The whiskers are thin and brown, the hair fine, sub-erect, and rather soft. The young, after losing their first woolly coat, are paler than the adults, and their markings are obscure.

Fabricius gives the length of the adult animal as four feet, seldom four and a half; Nilsson says three, while Malmgren states that they sometimes attain a still greater size, and that he has seen one five and a half Swedish feet in length.



CARNIVORA.
PINNIPEDIA.

PHOCIDÆ.



GREENLAND OR HARP SEAL.

Phoca grænlandica (Fabricius).

Specific Character.—Adult, tawny-grey or yellowish-white, sometimes spotted; male with a large blackish crescentic patch on its back and sides. Skull with the hinder edge of the bony palate entire, nearly straight; branches of lower jaw sub-parallel in front.

Phoca grænlandica, FABRICIUS, Müller's Prod. Zool. Dan. p. viii. (1776).
Calocephalus grænlandica, F. CUVIER, Dict. Sc. Nat. XXXIX. 545 (1826).
Pagophilus grænlandica, J. E. GRAY, Cat. Phoc. Brit. Mus. 25.

THE Greenland or Harp Seal is readily distinguishable, in the case of the adult male, by its peculiar markings. More constant characters, however, will be found in the structure of the skull, in which the posterior edge of the bony palate is not notched, but nearly straight, while the branches of the lower jaw are sub-parallel in front, instead of diverging at once, as in the other members of the genus.

It is not without considerable doubt that we retain the

Greenland Seal in the list of British Mammals; but, although we are unable to point out any undoubted native specimens in our Museums, the evidence in favour of its occasional occurrence seems too strong to be disregarded. In the first edition of this work two skulls are mentioned of Seals killed in the Severn, which were exhibited at a meeting of the British Association at Bristol in 1836 by our friend Dr. Riley, and which were at first referred by Prof. Nilsson to *Phoca annellata* (*Ph. hispida*), but were afterwards determined, both by that gentleman and by the author, to belong to the present species. Doubts have since been thrown on this identification by Mr. Ball, in his paper on Seals in the seventh volume of the "Transactions of the Royal Irish Academy," in which he considers that these skulls belonged neither to *Ph. annellata* nor to *Ph. grænlantica*, and that their species had yet to be determined. We are not aware where these specimens now are; but a careful comparison of the somewhat rude figure of one of them in Mr. Ball's lithographic sketches of Seals in our possession, seems to confirm our former decision; the distinctly transverse hinder margin of the palate is very marked, and in the meantime we must retain the belief that the skull in question was that of a young example of *Ph. grænlantica*. Our further evidence as to visits of the Harp Seal to our coasts is not very satisfactory. A young Seal taken in the Firth of Forth is doubtfully referred to this species by the late Mr. Macgillivray, as is one caught in the Thames in 1858 by Dr. Gray, but in neither case were the skulls observed. Mr. H. D. Graham, in a communication printed in the first volume of the "Proceedings of the Natural History Society of Glasgow," describes three large Seals seen by him in the Island of Jura which had all the markings characteristic

of this species, and he considers that it is confounded by the Hebridians with the Grey Seal under the name of "*Tapvaist*." Dr. Saxby stated, in the "*Zoologist*" for 1864, that several Harp Seals were seen in March of that year in the Voe of Baltasound, Shetland, and observes that the species is not very rare there, but is said only to be seen during bad weather. Lastly, we have been kindly informed by Mr. H. Evans of Darley Abbey, Derbyshire, that about the year 1856 he shot what he fully believes to have been a Greenland Seal near Roundstone, County Galway; most unfortunately the animal sunk and was lost, but Mr. Evans, who is well acquainted with the Common and Grey species, is perfectly certain that it was quite distinct from either.

This is an Arctic species, with a very wide lateral range, extending from North America to Nova Zembla, and probably still further to the east. It is strictly migratory, and is in no one locality found all through the year. It may be said to be resident on the coasts of Greenland, but leaves them twice annually, from March till May to breed, and again in the pairing season from July to September. In spring it is found in great numbers near the Island of Jan Mayen, and occasionally it wanders much further to the southward.

The Greenland Seal frequents the margins of the great ice-fields and the neighbouring floating masses, and it is said never to make an *atluk* or breathing-hole like the other species. Our friend Prof. Newton, who met with this Seal at Spitzbergen, observes (P. Z. S., 1864, p. 498):—"It is of a sociable disposition, and we saw it in herds of not less than fifty in number. These were very fond of swimming in line, their heads only above water, engaged in a game of 'follow my leader,' for on the first Seal making a roll over or a spring into the air,

each Seal of the whole procession on arriving at the same spot did the like, and exactly in the same manner." Mr. Newton suggests that a herd so employed may have been the origin of some of the stories of the Great Sea-Serpent, passing in undulating coils along the surface. Dr. Murie has remarked that the Harp Seals living in the Zoological Society's Gardens used their fore limbs occasionally in progression on dry land, employing them alternately to drag the body forward.

The food of this Seal consists of fish, of which Fabricius specially mentions *Cottus scorpius* and *Salmo arcticus*, and also of molluscous and crustaceous animals.

The young are born on the fixed ice in March; these are one, rarely two in number, according to Fabricius, but Dr. R. Brown says there are often two, and the sealers believe sometimes three. The cub retains its white woolly coat for a fortnight or three weeks, and, like the young Grey Seal, it refuses to enter the water till this is lost. The changes of colour which the animal undergoes are thus enumerated by Dr. Brown. While it retains the woolly coat it is known to the sealers as a "White-coat." Its first covering of short fur is dark speckled, and now it is a "Hare." The third stage, in which the back is bluish and the belly dark silvery, is distinguished by the name of "Blue-back," and finally the adult colouring is gradually assumed. Dr. Brown thinks that three years are sufficient for this cycle of changes, but in Greenland it is believed to occupy five years.

The annual take of this species in the Danish settlements in Greenland is estimated at thirty-six thousand.

In the adult male the general colour is tawny or yellowish-grey, sometimes nearly white. The so-called "saddle-mark" is a large crescentic patch of brown or

black, crossing the front part of the back and passing backwards towards the hind limbs. The muzzle and extremities are dark, the former sometimes nearly black. These markings, however, are not constantly alike, the saddle-mark being much more pronounced and regular in some than in others. The lower parts are of "a dingy or tarnished silvery hue."

The adult female, says Dr. Brown, is of a dull whitish or yellowish straw-colour, and tawny on the back. Some are bluish or grey above, with oval markings, these he believes to be younger individuals.

The adult animal attains usually a length of five feet, and sometimes more, but rarely reaches six feet.



CARNIVORA.
PINNIPEDIA.

PHOCIDÆ



GENUS CYSTOPHORA (Nilsson, 1820).

Generic Character.—Male with a large hood on nose, inflatable at will; muzzle hairy. Skull with ossified portion of mesethmoid produced in front of nasals. Teeth, inc. $\frac{4}{2}$, molars $\frac{5}{3}$, with large roots and compressed plaited crowns.

HOODED SEAL.

Cystophora cristata (Erxleben).

Specific Character.—Dark grey above, spotted with an even darker shade; lighter beneath. Length of adult from seven to ten feet.

<i>Phoca cristata</i> ,	ERXLEBEN, Syst. Reg. An., 590 (1777).
„ <i>leonina</i> ,	FABRICIUS, Fauna Gronl. (nec. Linn.) 1790.
„ <i>mitrata</i> ,	CUVIER, Ossem. Foss. V. 210.
<i>Cystophora cristata</i> ,	NILSSON, Skand. Fauna (1820).
<i>Stenmatopus cristatus</i> ,	F. CUVIER, Dict. Sc. Nat., XXXIX. (1826).

Neitersoak of Greenlanders, *Klapmyds* of Danes, *Bladder-nose* of Sealers.

This genus differs strikingly from the rest of the family, both in its external and osteological characters. The nasal aperture of the skull is much expanded, and

the bony partition of the nostrils is continued forward in front of the shortened nasal bones ; while there are four incisors in the upper jaw, and only two in the lower. But the most remarkable peculiarity is the large tuberculous hood, or bladder-like appendage, on the nose of the adult male, which is capable of being expanded when the animal is excited, and seems designed to protect its most vulnerable point from injury.

The Hooded or Crested Seal is an inhabitant of the polar seas, but does not appear to extend very far north. It is migratory in its habits, being found in South Greenland from April to June, and reappearing in August. Dr. R. Brown gives the yearly take in the Danish settlements at about two to three thousand ; in North Greenland, this species is only a straggler, but he has seen it not uncommonly at Disco Bay, and killed it at Melville Bay. It is found on the American coasts, and is common in March and April at Jan Mayen. Occasionally it occurs on the coasts of Iceland and Northern Scandinavia, and it is recorded as a native of the Spitzbergen seas by Martins and Scoresby, but Herr Malmgren says that it has not been observed by more recent voyagers. What appears to have been a Bladder-nose is recorded to have been killed in the Sound so far back as 1549, and in France a young male was taken at l'Île d'Oléron in 1843, and is figured in Gervais's "*Zoologie et Paléontologie Françaises.*"

Two specimens of the Hooded Seal are certainly known to have been killed in Britain, and it seems probable that other examples have occurred. A young example was taken in the River Orwell on the 29th June, 1847, as recorded by Mr. W. B. Clarke, and is preserved in the Ipswich Museum ; this specimen is described as being only forty inches in length, of a nearly uniform grey

above, darker posteriorly, and yellowish-white beneath. A second, also young, was found on a rock opposite St. Andrews, on the 22nd July, 1872; it made no attempts to escape, and was killed with stones. This example, which measured forty-seven inches in length, is described in detail by Mr. R. Walker in the "Scottish Naturalist," vol. ii., p. 1. Messrs. Baikie and Heddle, in their "Historia Naturalis Orcadensis" (1848), state that specimens are said to have been killed at Rousa and at Papa Westra. Mr. Ball, in his paper on Irish Seals in vol. viii. of the "Transactions of the Royal Irish Academy," quotes a letter from Mr. R. W. McIlwray, of Co. Mayo, describing an extraordinary Seal seen by him near Westport, which had the forehead enlarged "with immense bladder-like protuberances over the eyes,"—it also seemed to have external ears. Lastly, we may observe that, as far back as 1577, mention is made in Hollingshed's "Cronicle" of "sundry fishes of monstrous shape, with cowls over their heads like unto Monks, and in the rest resembling the body of Man," whose appearance in the Firth of Forth was followed by pestilence and murrain. Both of these last notices seem probably to refer to this strange-looking Seal, and it may be observed that its occasional occurrence on the northern coasts of Norway has excited the superstitious fears of the natives, who describe it, according to Bishop Gunnerus, as a sort of Merman, named *Klakkekalen*—a hairy man with a cap on his head, seen standing upright among the waves.

In its native seas this species is described as being the boldest and most fearless of the Seal tribe. "The male Bladder-nose," writes Dr. R. Brown, in the paper to which we have so often referred, "is in truth the lion of the sea, dividing the empire of the polar waters with his huge ally the Walrus. Instead of flying from the

hunter, he will calmly await the approach of danger, preparing for defence by betaking himself to the centre of the piece of ice he is on, and blowing up the air-bladder on his forehead, while he rears his head and snuffs the air like an enraged bull, and often gives battle successfully, making the clubs fly from the hands of his assailants with his flippers, his head being protected as by a helmet by the air-bladder. He will then in turn act on the offensive and put his opponents to flight, pursuing them with a shuffling serpent-like motion over the ice ; the result often proving somewhat dangerous to the panic-struck hunter if his boat has left that piece of ice, as the Seal will use his tusks rather ferociously when thus enraged. However, he is not inclined to give battle unless provoked, and looks a dull stupid sort of epicurean, as he lolls on the surface of the ice, and gazes about with his large black eyes with an apparently unmeaning stare." Fabricius compares the voice of this species to the barking and whining of a dog.

In its food this species resembles the other larger Seals—it is said by Fabricius to be particularly fond of cod and flounders. Herr Malmgren describes it as more pelagic in its habits than any other species, except *Ph. grænländica*, and as being very seldom found near land.

The Hooded Seal is polygamous, and the males fight desperately during the pairing season. One young one is born on the ice about the month of April ; it is at first pure white, but soon becomes darker.

The adult male is distinguished by the large double sac on its nose and forehead, which is divided by a cartilaginous crest, a continuation of the nasal septum. In a state of rest this hood is flaccid, but when the animal is irritated it is fully inflated with air. The body is long, but robust ; in the fore-paw, the first finger is the

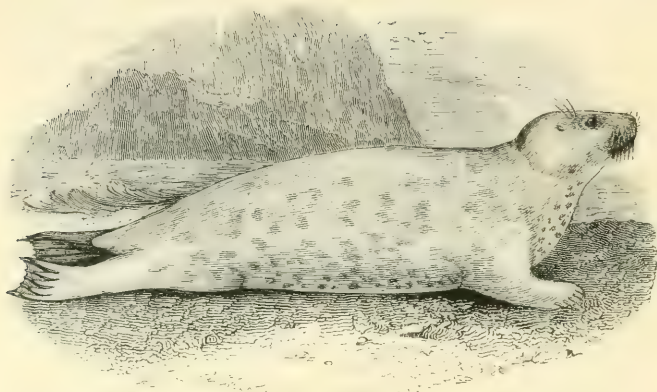
longest, the rest being gradually shorter to the fifth. The hair is rather long, and the under-wool is very soft and thick. The upper parts are dark grey, nearly black, with oval spots and markings of a still darker shade; the lower parts are lighter grey. The young, after losing their first woolly white coat, are grey above and white below.

The size of this species appears to vary considerably; Fabricius gives the length of the adult as eight feet, Nilsson says seven to eight feet, and Scoresby ten to twelve feet.



CARNIVORA.
PINNIPEDIA.

PHOCIDÆ.



GENUS HALICHÆRUS (Nilsson, 1820).

Generic Character.—Head flattened, muzzle deep, truncated. Brain-case of skull small, nasal opening very large. Teeth, inc. $\frac{1}{1}$, molars $\frac{2}{2}$, conical, simple, hardly tuberculated, only the last two in the upper jaw, and the last one in the lower, with double roots.

GREY SEAL.

Halichærus gryphus (Fabricius).

Specific Character.—Yellowish-grey, lighter beneath, with dark grey spots and blotches. Bony palate nearly transverse behind, slightly concave; posterior palatine foramina opening on palatines.

Phoca gryphus, FABRICIUS, Skrift. Naturh. Selsk. I. 167 (1790).

Halichærus griseus, NILSSON, Skand. Fauna (1820).

Haaf-fish of Orcadians, *Tapraist* of Hebrideans.

THIS large Seal was first described by Fabricius as *Phoca gryphus*, and was generically separated by Prof. Nilsson under the name of *Halichærus griseus*. It is at once distinguished from the true *Phocæ* by the form of its skull and molar teeth. The facial bones are very

large in proportion to the brain-case, which is much narrowed; the nasal opening is extremely large, the hind margin of the bony palate is concavely rounded, and the posterior foramina open on the palatine bones. The grinders are conical, and very simple in form, with hardly any tubercles, and only the last two of the upper, and the last one of the lower jaw, have double roots. Externally the body is elongated, the head flattened, and the muzzle deep and obliquely truncated.

The Grey Seal inhabits the temperate northern seas rather than the polar waters. It frequents the shores of the North Sea and Baltic, and is well known on the coasts of Iceland, Scandinavia, Denmark, and North Germany. According to Blasius, it is the commonest species in Iceland, where (as in Ireland) it is more gregarious than in the Baltic. Dr. R. Brown cannot claim it with certainty as a native of Greenland, though he believes that it sometimes visits the southern parts along with the Harp Seal, and Herr Malmgren states that it is unknown at Spitzbergen, but considers it to be the *Grönfälg* of the Laps, occasionally seen in small numbers on the coast of Finmark.

The existence of a very large Seal on the British coasts has long been known, but it was always referred to *Ph. barbata*, and it is to the investigations of Mr. Ball of Dublin that we are indebted for its proper identification. That gentleman having obtained specimens in Ireland which he was unable to name, brought the matter before the British Association in 1836, when his specimens were recognized by Prof. Nilsson as belonging to his *Halicharus griseus*. On examining Donovan's Orkney Seal, attributed to *Ph. barbata*, in the British Museum, Mr. Ball found that it was an ill-prepared example of the same species. Since that time

the Grey Seal has been recognized on many parts of our coasts. It is undoubtedly the *Haaf-fish* of the Orcadians and Shetlands, and appears certainly to be the *Tapvaist* of the Hebrideans, of which the following account is given by Mr. Wilson in the first volume of the "Magazine of Zoology and Botany":—"The *Tapvaist* or Great Seal is observed occasionally ashore with individuals of other kinds, but notwithstanding this it may be characterized as being of solitary habits, and as selecting the most remote and unfrequented situations. It is neither so lively nor so watchful as the Common Seal, nor is it so easily alarmed. It resembles that species in its general colouring, but may at once be distinguished from it by its enormous size." Mr. Wilson adds that the young is born above high-water mark in the end of September or beginning of October, and is at first covered with white hair, which is retained for many weeks, but shed before it takes to the water; the average weight of the adult he estimates at about thirty stone. One of the principal stations of this species in the Hebrides is a rock named Haskeir, near North Uist; here, according to Capt. H. J. Elwes ("Ibis," 1869, p. 25), large numbers were formerly destroyed, but of late years the proprietor has wisely put a stop to the slaughter, as the Seals were in danger of total extermination. Dr. Brown considers this as a very common species in the Hebrides, so much so that his friend Captain McDonald killed no less than seventy in a cruise of a few weeks. On the mainland of Scotland the Grey Seal is comparatively rare; Prof. Turner has recorded that two young ones were taken near Montrose in 1869, and an adult female near St. Andrews in 1870 ("Journal of Anat. and Phys.," 1870); he learns also from Dr. Stirling that it is well known in the Tay by the

name of "Black Seal," where it is very destructive both to fish and nets.

Mr. Edmonstone's account of the Great Seals of Shetland ("Zetland Isles," v. II., p. 294), agrees with Mr. Wilson's observations. They associate in pairs, frequent the most exposed situations, and bring forth their young in September, October, or November. In our first edition, under the head of *Ph. barbata*, we quoted some remarks by the late Mr. Selby on the Great Seals of the Farne Islands; these also are to be referred to the present species, as is proved by specimens presented by that distinguished naturalist to the British Museum. He observes that "this species calves in the month of November upon several of the outer rocks, where the young are suckled every tide for the space of fourteen or fifteen days." A Grey Seal has been taken in the Severn, and is preserved in the Bristol Institution; and in 1857 a specimen was killed in the Isle of Wight, as recorded by Capt. Hadfield in the "Zoologist" for that year (pp. 700, 787). The Zoological Society have received living specimens from the coast of Wales.

On the southern and western coasts of Ireland, where this species is very abundant, it is more gregarious than in most other places. Mr. Ball has heard of as many as thirteen being seen together, and Mr. H. Evans kindly sends us the following note on the habits of the species in County Galway: "I have got within a short distance of, say, ten or twelve Grey Seals, lying on scattered though neighbouring rocks, and uttering the most dismal howlings in chorus. The largest I have ever killed weighed six hundredweight—he was a grand old bull."

The following extracts of a letter from our friend Mr. A. G. More, give a graphic account of his successful shot at a large individual of this species:—

“The *Halichærus* whose photograph I sent to you in 1869, I had the good luck to shoot, and still more to retrieve from deep water, close to a little rocky islet called Eagle Rock, which lies off Connemara, between Golan Island and the Isles of Arran. It was a full-grown male, and had been known to frequent the locality for many years. I took from its skin a musket-ball, which was embedded just between the skin and the blubber, thus showing that the old veteran had been under fire before. The beast sank at once on receiving my bullet, leaving only a great patch of blood to show the place, and we had to wait more than an hour before the water became sufficiently clear to see him where he was lying dead at the bottom. Then, by means of a long pole borrowed from the gatherers of seaweed, to which we attached a harpoon which I always carried with me, we succeeded in raising our prize, and carried him joyfully into Arran, where all the country people said it was the biggest Seal they had ever seen. The weight on scales in Dublin was $3\frac{1}{2}$ cwt. (near 400 lbs.). Its extreme length, in a line from nose to end of flipper, 8 feet exactly; girth of body at thickest, 5 ft. 3 in.; round the fore-arm, $12\frac{1}{2}$ in.; spread of flipper, 21 in. In my own experience, they are the most difficult of all animals to approach. During four days’ Seal-hunting last August I never got nearer than eighty yards of a swimming head, and I have always found it extremely hard to stalk them when out of water.

“When lying on flat rocks or level sand-banks, the Seals have a way of turning up their hind flippers and the head at the same time, so as to form a kind of curve, especially when they stretch themselves.”

If we turn from these home observations to the accounts given of this species by northern naturalists,

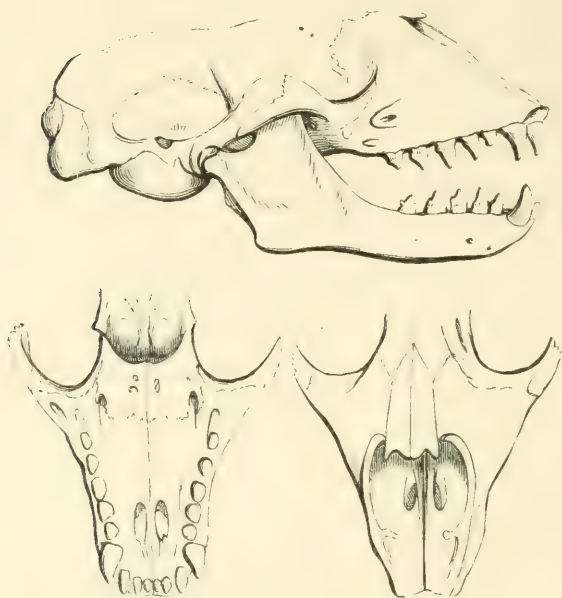
we find a curious discrepancy as to the time of breeding. On the coast of Sweden this is stated by Nilsson and others to be in February, whereas all British observers concur in stating that it is in October or November. It seems possible that the explanation may be that the milder climate of Britain permits of pairing taking place much earlier than in Scandinavia.

As might be expected from the comparatively small size of the brain, the Grey Seal is very inferior in intelligence and docility to the species we have already treated of. Mr. Ball says it seems scarcely susceptible of domestication, his father made several attempts to rear and tame it, but in vain; and Mr. Bartlett informs us that the one now in the Zoological Society's Gardens is both greedy and savage.

We have already pointed out the principal characters of this species. In colour it varies so much that it is difficult to give any definite description; to quote the words of Mr. Ball: "The changes of colour from age, season, sex, &c., of our *Halichærus* seem so various as to offer no guide to a determination of species. In the many specimens I have seen I do not recollect that any two were precisely similar. The very young females are generally of a dull yellowish-white, with rather long hair, which falls off in about six weeks after birth, and gives place to a shorter and more shining coat of a warm dingy yellow, variously blotched with blackish-grey, the whole gradually becoming more dull, the blotching more indistinct, and a general dark shade spreading over the back, as the animal advances in age." Owing to the flattened and recurved character of the hair, the animal when dry appears uniform silvery-grey when seen from before, and of a sooty brown when viewed in an opposite direction, the blotches being only

visible on a side view. Mr. More considers that only *young* males have a dark muzzle.

The adult animal attains a length of from seven to ten feet.



CARNIVORA.
PINNIPEDIA.

TRICHECHIDÆ.



Genus *Trichecus* (Linnæus, 1766).

Generic Character.—Limbs used as organs of support on land. No external ear. Teeth in adult, inc. $\frac{2}{0}$, can. $\frac{1-1}{0}$, mol. $\frac{1}{1}$ or $\frac{1}{2}$; canin developed into huge tusks, molars truncated, single rooted.

WALRUS.

Trichecus rosmarus (Linnæus).

Specific Character.—Greyish-brown, becoming lighter with age. Length of adult, twelve to fifteen feet.

Trichecus rosmarus, LINNÆUS, Syst. Nat. I. 49 (1766).

Rosmarus arcticus, PALLAS, Zool. Rosso-Asiat. I. 269.

Sea-horse of Sealers, *Morsk* of Laps; *Awuk* of Greenlanders and Eskimo.

ACCORDING to the arrangement here adopted, the Walrus is regarded as the type of a distinct family, of which it is the only known member. It may in many respects be regarded as intermediate between those which we have had under consideration, and the Eared Seals (*Otaridæ*) of the Southern and Pacific Oceans, agreeing

with the former in its general anatomy, and with the latter in the important point of the functional use of its limbs as supports of its body when on land. Instead of resting on its belly and progressing by the action of its abdominal muscles, as we have seen to be the case with the true Seals, the Walrus walks upright, though in an awkward and shuffling manner, the fore-paws being turned backwards, while the hind-feet are directed forwards and outwards. In its motions in swimming also, it holds an equally intermediate position, for, while the fore-feet are hardly used by the true Seals, and are the main organs of propulsion in the *Otaridæ*, all four limbs are employed by the Walrus; as Dr. Pettigrew remarks, "so far as the physiology of its extremities is concerned, it may very properly be regarded as holding an intermediate position between the Seals on the one hand, and the Sea-Bears and Sea-Lions on the other."

The Walrus is essentially an Arctic animal, and its geographical range has been very much circumscribed by the persecution of man. There can be no doubt that two or three centuries ago it was common on the northern coasts of Scandinavia and at Bear Island, where it is now almost unknown—in recent times Nilsson only mentions one killed in Nordland, about 1816. It is still plentiful, however, in the Spitzbergen and Greenland seas, and on the coasts of Arctic America, but even there it appears to be rapidly diminishing in numbers. On the west coast of America it was met with by Capt. Cook in latitude $58^{\circ} 42'$, and by Dr. Brown as far south as lat. 50° .

This species can only be regarded as a rare and accidental straggler to our coasts, though it is probable that its occurrence was formerly more frequent than it is now. In the Museum of the University of Cambridge

there is a very fine sub-fossil skull of a Walrus, which was found in peat near Ely. It was mentioned as visiting Scotland, by Hector Boece, whose authority is quoted by Sir Robert Sibbald. One was killed in December, 1817, at Caolas Stocnis, on the east coast of Harris, and was examined by the late Mr. Macgillivray, who gave an account of it in vol. XVII. of the "Naturalist's Library"; it was about ten feet in length, with tusks of eight and a half inches. A second was shot in June, 1825, on the island of Edday, Orkney, by one of the shepherds of Mr. Laing of Papdale; it was recorded by Mr. R. Scarth, in the "Edinburgh Philosophical Magazine" for that year, and its head was sent to the Edinburgh College Museum. Messrs. Baikie and Heddle state that another Walrus made its appearance in Hoy Sound in 1827, but it was not captured. One was killed in April, 1841, on the East Heiskar, near Harris, by Capt. McDonald, R.N., as mentioned by Dr. R. Brown, in the "Annals and Magazine" for 1871; and in the "Proceedings of the Zoological Society" for 1868, Dr. Brown remarks:—"I know of one that was seen in Orkney in 1857, and another, the Shetland fishermen told me, had been seen in the Nor' Isles about the same time."

In its native climes the Walrus consorts in large herds, to the number of hundreds, on the fixed and floating ice; in the former it keeps open *atlucks*, like the Seals. When assailed it at once betakes itself to the water, but if cut off from its haven of refuge, it fights fiercely, and even in the sea a wounded Walrus will not hesitate to attack a boat, tearing the planks asunder with its tusks, and continuing the conflict till the hunter's lance or bullet finds a mortal spot.

Very various accounts have been given of the food of this animal. It was long supposed to feed exclusively

on sea-weed, and Sir Everard Home was informed by Mr. Fisher that the stomachs of two which he opened contained *Fucus digitalis* only. Mr. Lamond, however, in his "Seasons with the Sea-horses," states that all those which he examined contained the remains of various molluscous, radiated, and annulose animals, although he believed that sea-weeds might occasionally be eaten. Herr Malmgren, who in "Wiegmann's Archiv" for 1864 has given by far the best recent account of the habits of the Morse, tells us that it lives almost exclusively on two species of Mollusks, *Mya truncata* and *Saxicava rugosa*, which burrow three to seven inches deep in the mud at a depth of ten to fifty fathoms—the Walrus digs these up with his tusks, cleverly denudes them of their shells with its tongue and grinders, and swallows them whole. He only found one other animal in the stomach, a gigantic example of *Priapulius caudatus*. It is evident that this food can only be procured after the tusks have reached some size, and accordingly the young Walrus is suckled by its mother for *nearly two years*, by which time its canines have attained a length of three or four inches. Dr. Brown's observations in the Greenland seas are to a similar effect. "As to its being carnivorous," he says, "if further proof is necessary, I have only to add that whenever one was killed near where a whale's carcass had been set adrift, its stomach was invariably found crammed with the *krang*, or flesh of the cetacean."

According to Herr Malmgren, the pairing time is in May and June. The female goes nearly a year with young, and, as already mentioned, suckles her single calf for nearly two years. As she does not pair during this time, it follows that the increase of the species is extremely slow, only one young one being born in four years.

The Walrus is an animal of considerable intelligence and docility. In Hakluyt's "Pilgrimes" (1624) an account is given of a young one brought to England by Master Thomas Weldon, of the "God-speed" and exhibited at court—"As the beaste in shape is very strange, so it is of strange docilitie and apt to be taught, as by good experience we often proued." Dr. Brown mentions one he saw in Greenland which was perfectly tame and seemingly happy, answering to its name and returning to call even when let loose in the sea. Two examples have been exhibited of late years in the gardens of the Zoological Society, but neither of them survived long. The first was purchased in 1853, but only survived a few days; the second, captured in Davis Strait in August, 1866, was brought to London in November, 1867, and lived in the gardens about six weeks. We had the pleasure of seeing this specimen, which was a young male of about eight feet in length, with partially developed tusks. In its gait and general appearance its relationship to the Sea-Bears was very striking. It was fed principally on mussels and whelks, and also on sprats and other fish, but it steadily refused the most tempting proffers of sea-weed. It soon came to know its keeper, and to answer to his call, but unfortunately it died on the 19th December. On dissection, Dr. Murie found that its stomach was extensively ulcerated and contained an immense quantity of intestinal worms of an undescribed species, which has since been named *Ascaris bicolor* by Dr. Baird.

The name Walrus is from the Norse *Hval-ros*, "whale-horse" or "horse-whale." Thus in Alfred the Great's Saxon version of Oronius we read that Oether, the Norwegian voyager, "told the King that he went to the north chiefly on account of the horse-whales (*horses-*

hvalum), because they have very good bone in their teeth : of these teeth they brought some to the King : and their hides are very good for ship-ropes." *Rosmar*, another Norse name, means "Sea-horse ;" and *Morse* is from the Russian *Morss*, Lap *Morsk*. The Greenlandic name, *Awuk*, is an imitation of the animal's cry, which Dr. Brown describes as a guttural "āōōk ! āōōk !"

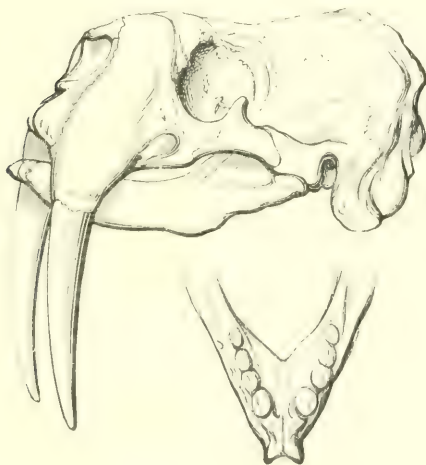
The head of the Walrus is rounded, and the muzzle is enormously enlarged to give room for the roots of the great tusks. The bristles of the whiskers are very thick, stiff, and semi-transparent; the eyes are small and bright; the orifices of the ears very small and placed far back. The skin is marked with numerous transverse folds on the neck and flanks, and is covered with short close hair. The colour is light brown, darker in the young and paler in the aged animal.

The milk dentition of the Walrus is given by Wiegmann as inc. $\frac{6}{6}$, can. $\frac{1}{1}:\frac{1}{1}$, mol. $\frac{5}{5}:\frac{5}{5}$. In the adult there are only two small incisors in the upper jaw, and even these are usually lost in macerated skulls. In many specimens there are an additional pair of very small molars, which Prof. Peters considers to be milk teeth abnormally retained ; but Prof. Flower regards it as an open question whether they are not rather permanent teeth in an aborted condition. The enormous canines, which yield a very white and dense ivory, are usually about eight to fourteen inches long in the adult animal, but are sometimes much larger. A pair from Spitzbergen formerly in our possession, now in the Cambridge University Museum, are two feet long, and a single tusk in the Oxford Museum is thirty inches in length, including the portion contained in the socket. In these very long tusks a slight spiral twist is often perceptible.

The adult animal attains a length of ten to fifteen feet ;

Crantz says that it even reaches to eighteen, and Cuvier to twenty feet.

The ordinary position of the animal on shore is shown by our figure, which is a copy of an old engraving "ad vivum delineatum ab Hesselø G. A." published in "L'Histoire du Pays nommé Spitzberghe," at Amsterdam, in 1613. Old as it is, it is the best representation of the adult Walrus with which we are acquainted, and has been repeatedly copied, as by Laet, Wormius, Jonston, Shaw, &c. Most of the figures in books have been drawn from preserved specimens, and assign the position of a true Seal to the animal.



Genus, *Sciurus*.

SQUIRREL.

Generic Character.—Clavicles complete; grinding teeth $\frac{5}{4}:\frac{5}{4}$, simple, the summits tubercular, the anterior one in the upper jaw extremely small; upper incisive teeth chisel-shaped, lower ones pointed, compressed laterally; toes long and free; tail long and bushy.

COMMON SQUIRREL.

Sciurus vulgaris (Linn.).

Specific Character.—Brownish-red above, white beneath; tail very bushy, of the same colour as the body; ears tufted.

Σελουρος,

OPPIAN Cyneg.

Sciurus,

PLIN. Hist. Nat. lib. VIII. c. xxxviii.

,, vulgaris,

LINN. Syst. Nat. I. p. 86. MULL. Zool. Dan. Prod. p. 5, sp. 32. DESMAR. Mammal. p. 330, sp. 527. FLEM. Brit. An. p. 20. JENYNS, Brit. Vert. p. 29.

Sciurus alpinus,

F. CUV. Mam. fasc. xxii. DESM. Mam. p. 543.

Sciurus italicus,

BONAP. Faun Ital.

Common Squirrel, PENN. Brit. Zool. I. p. 107. SHAW, Gen. Zool. II. p. 134.

Ecureuil commun, BUFFON, Hist. Nat. VII. p. 253, t. xxxii. FR. CUVIER, Mammif. livr. xxii.

THE form and habits of this elegant and active little

creature combine to render it one of the most beautiful and entertaining of our native animals. Its movements are agile; its conformation and colours elegant and pleasing; its disposition, when early domesticated, gentle, playful, and familiar. Dwelling principally upon trees, and rarely descending to the ground, it leaps from bough to bough with astonishing agility. It lives upon nuts, acorns, beech-mast, the bark of young trees, leaf-buds, and tender shoots. In eating nuts, it gnaws with considerable rapidity through the hard shell, and then carefully removes every particle of the dry brown skin from each morsel of the kernel before it is eaten. We have also received unquestionable testimony that birds' eggs are occasionally eaten by it. It sits upon its haunches, holding its food in its fore paws, which serve the office of hands. In taking its leaps, when once thrown off by an effort of its long and powerful hinder legs, it is in a measure sustained by the horizontal spreading of its limbs and bushy tail; which latter organ is also extremely useful in covering and protecting its back, over which it is often turned, and in enveloping the whole lateral and dorsal parts of the body when coiled up during sleep or in its hibernation. It lays up stores of food for its winter provision, which is not usually deposited in a single place of safety, but distributed in several different holes of trees, in the immediate neighbourhood of its own retreat. It remains during the greater part of the winter in a state of almost complete torpidity—coming abroad, however, on the occurrence of a fine day, feeding on a part of its treasured hoards, and then retiring again to its slumbers. According to Pliny, the Squirrel closes its retreat on the side from which the wind is likely to blow, and opens it on the opposite direction. “*Prævident tempestatem et Sciuri; obturatisque, qua*

spiraturus est ventus, cavernis, ex aliâ parte aperiunt fores." *

A pair of Squirrels, for they are monogamous, do not readily change their place of abode, but remain attached for a long period to the same tree, seeking their food in the district immediately surrounding it. The nest is constructed in a very intricate and beautiful manner, of moss, leaves, and fibres, curiously interlaced; and is usually placed either in a hole in the tree, or in the fork between two branches, often where it can with difficulty be distinguished from the tree itself. The female brings forth three or four young in the month of June, which receive the most assiduous care from both parents, and remain with them until the following spring, when they separate, and choose their mates.

This pretty animal appears to be common over the greater part of Europe, but is not found, according to Pallas, in the Crimea. It has been met with in China, on the Amoor River. In our own country it is pretty evenly distributed over England and Scotland; in the north of the latter country, in the province of Murray, as we have learned by the kindness of the Rev. G. Gordon, it is now common, whereas fifteen or twenty years ago it was little known there. In Ireland, the Squirrel appears to be rare.

The Squirrel is liable to considerable variety in point of colour, becoming grey in the northern regions. Linnæus, in his "*Lachesis Lapponica*," states that the inhabitants of the Lapland Alps "contrive, by means of their wooden bows, to procure in the course of the winter a considerable number of Squirrels (*Sciurus vulgaris*), in their grey or winter clothing, for the sake of their skins."† We

* Plin. Hist. Nat. lib. VIII. c. xxxviii.

† *Lachesis Lapponica*, translated by Smith, II. p. 49.

possess a specimen from Archangel, in which some parts of the body have the fur of the same peculiar and beautiful grey which characterizes the American Grey Squirrel, the remaining parts being of the usual red colour of our English specimens. Even in this country, it appears that a certain degree of change takes place in the colour of the fur in spring and in autumn. Mr. Blyth was the first to notice this fact in this country, observing that in the summer the fur is much coarser and more uniformly red, the pencils of the ears also are lost, as had been observed by former naturalists; in the winter the sides of the body assume a greyish tint, the pencils of the ears are long and full, and the fur softer and fuller. The summer change is not perfect till July. A further change, however, takes place, which we have not as yet seen alluded to, excepting as a supposed accidental variety. Squirrels with cream-coloured tails are by no means uncommon in certain localities; and after the examination of a good muster of examples, we found that this pale colour of the tail always accompanied, or rather followed, the change in the colour and quality of the fur in the summer, as above noticed. In no instance have we observed the cream-coloured tail until towards the end of summer, at which time most of those we have inspected have had a more or less faded appearance, though the greater number have not been actually much paler than usual. At the change which takes place at the commencement of winter, the tail again assumes its ordinary appearance. An Alpine variety of this animal has been described by M. F. Cuvier, under the name of *Sciurus Alpinus*, having the back of a dark brown colour, dotted with yellowish-white, and the under parts pure white. It occurs, according to Desmarest, in the Alps and Pyrenees.

The head is thick, rounded posteriorly, flattened at

the sides and on the forehead ; the nose prominent ; the eyes black, prominent, large, and placed rather high on the sides of the head ; the ears straight, large, terminated by a pencil of long hairs ; the cutting teeth of the upper jaw broader than those of the lower, which are almost pointed, and much flattened at the sides ; the grinding teeth are four above and below, with the addition of a rudimentary one, consisting of a single tubercle, and often deciduous, placed immediately before the others in the upper jaw ; the neck is short, but distinct ; the body thick ; the back arched ; the tail long and very bushy, the hairs being distichous ; hinder legs very long, the heels touching the ground ; the fore feet formed for holding food ; the fingers long, furnished with prominent cushions, and with long sharp curved claws. The colour above is reddish-brown, beneath white.

Dimensions :—

	Inch.	Lines.
Length of the head and body	8	4
,, of the head	2	2
,, of the ears	0	9
,, of the tail to the end of the bone	7	0



RODENTIA.

MYOXIDÆ.

Genus, *Myoxus*. (Schreber.)

Generic Character.—Grinders $\frac{1}{2}$ $\frac{1}{2}$, simple, the summits marked with transverse ridges of enamel; fore feet formed for grasping, their claws short, thumb rudimentary; hind feet also formed for grasping, fifth toe short; tail long, somewhat bushy; general form somewhat thick and compact.

COMMON DORMOUSE.

SLEEPER.

Myoxus avellanarius. (Linnæus.)

Specific Character.—Fur light tawny above, paler and yellowish beneath; an elongated patch of white on the throat and fore part of the breast; tail somewhat shorter than the head and body.

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| <i>Mus avellanarius minor</i> , | RAY, Syn. Quad. 220. |
| <i>Mus avellanarius</i> , | LINN. Syst. Nat. p. 83, No. 14. PALLAS, Glir. p. 89. |
| <i>Sciurus avellanarius</i> , | ERXLEB. Syst. p. 433, 15. |
| <i>Myoxus muscardinus</i> , | SCHREBER, Saugth. p. 835, 4, t. ceciv. |
| <i>avellanarius</i> , | DESMAR. Mammal. p. 295, sp. 166. FLEM. Brit. Anim. p. 22. JENYNS, Brit. Vert. p. 39. |
| <i>Le Muscardin</i> , | BUFFON, Hist. Nat. VIII. p. 193, t. xxvi. F. CUV. Mammif. fasc. XXXVIII. |
| <i>Dormouse</i> , | PENNAE, Brit. Zool. I. p. 110. SUDER, Gen. Zool. II. p. 167, t. cliv. |

THE situation of the genus *Myoxus* in the natural arrangement of the *Rodentia* is one of some interest, as occupying a position between the *Sciuridæ*, or Squirrels, and the *Muridæ*, or true Mice. We do not deem it desirable, in a work like this, to enter at length into the somewhat ample system of classification at present made use of in this great order, but at the same time we are anxious to warn our readers against an opinion on the subject of classification, which we think is much too commonly entertained. We allude to the frequent belief that one animal, or group of animals, often forms a direct link or passage between two other groups; and the little animal which we have now under consideration has been supposed to constitute one of these links. It does, indeed, connect the Squirrels with the Mice, but it does so only by holding an intermediate position, and not by forming an even gradation from the one to the other; for the Dormouse, which, partaking of climbing characters on the one hand, has not these peculiarities developed in the same manner as in the Squirrels, but rather to enable it to creep amongst underwood than to climb trees; and on the other hand, although obviously having a certain relationship with the true Mice, it differs, nevertheless, in some important respects. It is a matter of frequent occurrence in intermediate groups, to find that they possess important characteristics which are quite peculiar to them. Thus, while the number of molar teeth in *Mus* is three in each jaw, in *Sciurus* five, and in *Myoxus* the intermediate number, yet in the structure of the teeth themselves, the latter differs very materially from both the others, and, indeed, from other *Rodentia*. This, with some other peculiarities, has induced us, with other zoologists, to recognize as a family the group to which the Dormouse belongs, under the name of *Myoxidæ*, coming after the

Sciuride, which may be regarded as the most highly organized group of the whole order. In the general appearance and habits of the Dormouse there is much to remind us of the Squirrels. Inhabiting dense shrubs and thickets—building its nest amidst the foliage of the underwood of coppices, or in the tangled vegetation of hedgerows—feeding upon corn, haws, young hazel-nuts, and fallen acorns—laying up a hoard of provision for the winter, and assuming an almost total torpidity during that ungenial season—its habits appear to be intermediate between the two families alluded to. The tail in the *Myoxus glis*, a common species in the south of Europe, is nearly allied to that of Squirrels; but that of our native species is farther removed from it, although still somewhat bushy, and having the same distichous arrangement of the hairs.

The toes, although prehensile, are destitute of the strong claws which enable the Squirrel to ascend the naked boles of trees with such astonishing rapidity, but have these parts weak and short, and are formed instead to perform pretty much the office of hands, enabling the creature to climb from sprig to sprig in the branches of trees or amongst underwood. Both fore and hind feet are well padded internally with fleshy broadish tubercles, thus converting them, as we have already intimated, into hands, in the use of which the creature, when creeping about in a bush of whitethorn, as we have seen it, exhibits an adroitness which is quite unequalled by the little agile Harvest Mouse, and scarcely surpassed by the Squirrel.

Although extremely gentle and inoffensive, and easily rendered familiar when in confinement, it chooses its habitation far from the haunts of man, and, from its retiring and nocturnal habits, is not easily observed and taken. It is found in the localities indicated above,

where little colonies are sometimes seen inhabiting a space of no considerable extent. Our late friend, Mr. Yarrell, has informed us that he has seen not less than ten or a dozen—or even more—of their nests built in the shrubs of a thicket. It takes its food holding it in its hands, and sitting on its haunches like a Squirrel, and often suspending itself by its hinder feet, in which position it feeds as easily and comfortably as in the more ordinary position. Towards the winter it becomes exceedingly fat; and having laid up a store of food, retires to its little nest, and coiling itself up into a ball, with the tail over the head and back, becomes completely torpid. A mild day calls it into transient life: it then takes a fresh supply of food, and relapses into its former slumber; and finally awaking in the spring, at which time it has lost much of its fat, it enters upon its usual habits, and the enjoyment of the conjugal and parental affections. The young, which are generally about four in number, are born blind; but in a few days the eyes are opened, and in a short time they are able to seek their food independently of the parents' care. We have reason to believe that, in some cases at least, the Dormouse has a second brood early in the autumn, as we have received from one locality, in the month of September, an adult, one about half grown, evidently of the spring brood, and three very young ones, apparently not more than a fortnight or three weeks old. The young Dormouse is at first of a mouse-grey colour, the head and flanks alone having a reddish tinge: by degrees the grey disappears, and gives place to the delicate reddish-brown of the adult garb; but it is not until the following spring that this change is completed. The young ones enter into their hibernation much more tardily than the old ones. In one instance an adult became torpid about the middle of October;

one of the spring brood about six weeks afterwards; and those born in autumn died early in the winter, without having ever attempted hibernation,—and although they had continued to feed, they died extremely thin. The name *avellanarius* is due to the supposition that the principal food of the Dormouse consists of the hazel-nut, the shell of which they readily gnaw with their small but strong incisors.

The Dormouse appears to have been found in most parts of Europe, though it is in some countries less common than the larger species. In the south of France, according to M. Crespon, it is not so often met with as *Myoxus glis* or *M. nitela*. It occurs in Switzerland, and is accordingly included in the Fauna Helvetica of Prof. Schinz, and is mentioned as an inhabitant of Scandinavia by M. Nilsson, but we do not find any record of it either in “Zoologica Russo-Asiatica,” of Pallas, or in the recently published work of Dr. L. Von Schrenck, on the Mammals of the region of the Amoor river.

The head of the Dormouse is rather large for the size of the animal; the eyes black, large, and prominent; the forehead raised; the muzzle rather pointed; the ears rather more than one-third the length of the head; the body rounded and full; the tail flattened, nearly linear, furnished with rather long hairs, which stand out on each side; the fore feet with four toes and the rudiment of a thumb, the hinder with five toes.

Dimensions:—

	Inch.	Lines.
Length of the head and body	3	0
„ of the head	0	11
„ of the ears	0	4
„ of the tail	2	6
„ of the fore foot	0	5
„ of the hind foot	0	7

RODENTIA.

MURIDÆ.

Genus, *Mus*.

MOUSE, RAT.

Generic Character.—Grinders $\frac{3}{3}:\frac{3}{3}$, simple, with tubercular summits; superior inciseive teeth wedge-shaped, inferior ones compressed and pointed; tail nearly naked, annulated with scales.

HARVEST MOUSE.

Mus minutus. (Pallas.)

Specific Character.—Fur light orange-brown on the upper parts, white beneath, the two colours distinctly circumscribed; ears one-third the length of the head.

Mus minutus,,, *messoriæ*,

,, *pendulinus*, *soricinus*, and *parvulus*,
Mulot nain
Rat des Moissons,
Harvest Mouse,
Minute Mouse,

PALLAS, Glir. p. 96, 45. ERXLEB.

Syst. p. 401, 11. GMEL. Linn.

Syst. Nat. I. 130. DESMAR.

Mammal. p. 304, sp. 485.

SHAW, Gen. Zool. II. p. 62, fig.

in titul. MONTAGU in Linn.

Trans. VII. p. 274. DESMAR.

Mammal. p. 302, sp. 479.

FLEM. Brit. An. p. 19. JENYNS,

Brit. Vert. p. 31.

HERM. Obs. Zool. I. p. 57, 62.

FR. CUVIER, Mammal. II.

,, ,, IV.

PENN. Brit. Zool. I. p. 120, No. 29.

SHAW, Gen. Zool. II. p. 64, t.

CXXXI.

ALTHOUGH it is certainly to Gilbert White that we owe the first published account of this elegant little animal as indigenous to this country, it appears to have been seen, though without exciting due attention, by Montagu, who, in the seventh volume of the Linnean Transactions, records his having seen it in Wiltshire before the discovery of it in Hampshire by the former naturalist. White communicated his discovery to Pennant, who immediately published it, with the acknowledgment of his authority, in the second edition of his *British Quadrupeds*; and again in the subsequent editions, without that acknowledgment. From this source it has been copied into almost every subsequent work on British mammalia, and with but little addition to our knowledge as to its habits, with the exception of Montagu in the place alluded to, Bingley in his *Animal Biography*, and Dr. Gloger in the *Transactions of the German Academy*, who have thrown much light upon many interesting points in their economy, both in a state of nature and in confinement. The most complete epitome of the information thus scattered, is to be found in a note to the recent edition of *White's Selborne*, by our lamented friend, Mr. E. T. Bennett, whose loss at the moment of its completion shed a gloom over the appearance of that delightful book which he so much enriched with his varied and extensive information.

The Harvest Mouse has now been found in most parts of England, amongst others in Hampshire, Wiltshire, Gloucestershire, Devonshire, and Cambridgeshire—in the latter of which counties it was often seen by the father of the author of the former edition probably not less than ninety years ago, and described by him as a third species of Field Mouse. It is commonly carried in sheaves of corn into wheat-ricks or into barns, and lives and multiplies in such situations with great rapidity.

Although common, we have observed that it is somewhat local, appearing in considerable numbers in certain fields, or farms, but not occurring in others, although near. It feeds principally on corn; but from the observations of Mr. Bingley, it would appear that it occasionally feeds, nothing loath, upon insects also. "One evening," says this agreeable writer, speaking of an individual of this species which he had in confinement, "as I was sitting at my writing-desk, and the animal was playing about in the open part of its cage, a large blue fly happened to buzz against the wires. The little creature, although at twice or thrice the distance of her own length from it, sprang along the wires with the greatest agility, and would certainly have seized it, had the space between the wires been sufficiently wide to have admitted her teeth or paws to reach it. I was surprised at this occurrence, as I had been led to believe that the Harvest Mouse was merely a granivorous animal. I caught the fly and made it buzz in my fingers against the wires. The Mouse, though usually shy and timid, immediately came out of her hiding-place, and running to the spot, seized and devoured it. From this time I fed her with insects, whenever I could get them; and she always preferred them to every other kind of food that I offered her."

It is not only one of the prettiest, but, with the exception of the *Sorex pygmæus*, the smallest of all the British mammalia; and its habits are at least as interesting as those of any more conspicuous and important species. Although very gentle in disposition, seldom attempting to bite when taken hold of, it is not very easily rendered familiar, being in this respect much inferior to the common Field Mouse, but it may be kept in confinement for a long time in good health, by allowing it the optional use of a sort of little tread-wheel, in which it will often exer-

cise itself, apparently to its amusement and satisfaction; and it was probably from the absence of this healthful exercise that Montagu failed to keep it in confinement. It was observed by the Rev. Wm. Bingley, that the tail of this species is prehensile—a fact which has subsequently been alluded to by Mr. Broderip, in the fifth volume of the *Zoological Journal*.

It appears to retire, like other Mice, to little burrows during the winter months: but it also remains the whole of this season in ricks of corn, in which situations, according to the testimony of more than one writer, it does not become torpid as it does when hibernating under ground. Its beautiful little round nest, of which a representation is given in the vignette at the foot of this description, was first described by White as being “most artificially platted, and composed of the blades of wheat; perfectly round, and about the size of a cricket-ball, with the aperture so ingeniously closed, that there was no discovering to what part it belonged. It was so compact and well filled that it would roll across the table without being discomposed, though it contained eight little Mice that were naked and blind. As this nest was perfectly full, how could the dam come at her litter respectively, so as to administer a teat to each? Perhaps she opens different places for that purpose, adjusting them again when the business is over: but she could not possibly be contained in the ball with her young, which, moreover, would be daily increasing in bulk. This wonderful ‘procreant cradle,’ an elegant instance of the efforts of instinct, was found in a wheat-field suspended in the head of a thistle.” Dr. Gloger describes its nest still more particularly; and as we have not seen his paper, we extract the following account from Mr. Bennett’s quotation of that naturalist’s observations:—

“It was beautifully and elaborately constructed of the panicles and leaves of three stems of the common reed interwoven together, and forming a roundish ball, suspended on the living plants at a height of about five inches from the ground. On the side opposite to the stems, rather below the middle, was a small aperture, which appeared to be closed during the absence of the parent, and was scarcely observable even after one of the young had made its escape through it. The inside, when examined with the little finger, was found to be soft and warm, smooth, and neatly rounded, but very confined. This nest contained but five young: but one less elaborately formed, previously examined by Dr. Gloger, was found to afford shelter to no less than nine. The panicles and leaves of the grass were very artificially woven together, the latter being first slit by the action of the little animal's teeth into more or less minute bands or strings. No other substance was used in the construction of the nest, which was altogether without cement, or any means of cohesion, save the interweaving of its component parts: it consequently suffered considerable disturbance even from the most careful handling, losing in neatness of form as much as it gained in its increasing size.”* We have often seen the nest in the neighbourhood of Stratford-on-Avon, and can testify to the accuracy of Dr. Gloger's description.

This little animal probably breeds during a considerable portion of the year in favourable situations; and as it brings forth from five to eight, or even nine young at a time, its increase would be immense did it not prove an easy victim to every beast and bird of prey. In those instances in which it has brought forth its young in con-

* White's Selborne, by Bennett, p. 58, *note*.

finement, it appears that the mother has speedily killed and partly eaten her offspring.

The propriety of considering the *Mus minutus* of Pallas as identical with White's species was apparent to Shaw, and is also urged by Montagu. Fischer, too, in his Synopsis, has this note:—"An reverà à *M. minuto* distinctus?" In the description there is not a single character that does not appertain to both, and there can no longer be any doubt of their identity;—an opinion in which Mr. Bennett appears to have fully agreed. It is certainly also the *Mulot nain* of M. Fr. Cuvier, described in the second volume of his *Histoire Naturelle des Mammifères*.

The Harvest Mouse is spread over nearly the whole of Europe, extending as far north as Russia and Siberia; and as a southern locality, it may be mentioned, that although not included in the Fauna Italica of the late Prince Buonaparte, it has been found in the north of Italy by Prof. Blasius. The late Professor Macgillivray, in his work on British Quadrupeds, forming one of the volumes of the Naturalist's Library, mentions three localities in Scotland in which it has been known to occur, viz., Aberdeenshire, Fifeshire, and near to Edinburgh. In Ireland it would seem to be very rare, but through the kindness of Dr. Kinahan, we are enabled to record it as an inhabitant of that country.

The general form is rather more elongated and slender than that of most of the genus: the head rather narrow; the eyes are less prominent than in the Common Field Mouse, black; ears about one-third the length of the head, rounded; tail rather shorter than the body. Fur above of a reddish-brown colour, rather brighter than that of the Dormouse; the hair being dusky at the base, and red towards the point: the under parts pure

white; the two colours being separated by an abrupt line.

We have met with one of these Mice in Warwickshire, which had all the upper parts of a dirty sulphur yellow, the under parts being, as usual, pure white. One which we kept for a considerable time in confinement, and fed principally upon hempseed, although at first of the ordinary colour, became after a time very much mottled with dark brown on the back. Thinking that it would eventually become black by a continuance of the same food, as Bullfinches are said to do, it was fed for several months almost exclusively on hempseed, but no further change in colour took place.

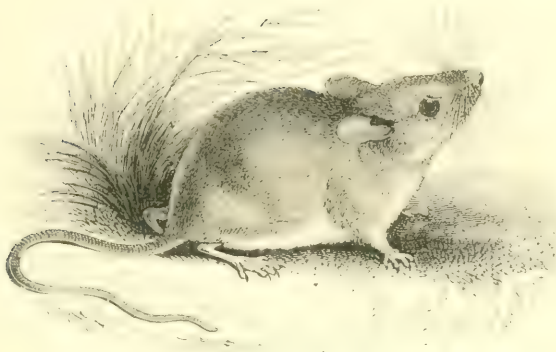
Dimensions:—

	Inch.	Lines.
Length of the head and body	2	6
„ of the head	0	9½
„ of the ears	0	3
„ of the tail	2	5



RODENTIA.

MURIDE



LONG-TAILED FIELD MOUSE.

WOOD MOUSE.

Mus sylvaticus. (Linn.)

Specific Character.—Reddish-brown above, whitish beneath, with a light brownish spot on the breast; ears more than half the length of the head; tail nearly as long as the head and body.

- | | |
|---------------------------------|--|
| <i>Mus sylvaticus,</i> | LINN. Syst. Nat. I. p. 84, 17. ERXLEB. Syst. p. 388,
4. DESMAR. Mammal. p. 301, sp. 477. FLEM.
Brit. An. p. 19. JENYNS, Brit. Vert. p. 30. |
| „ <i>domesticus medius,</i> | RAY, Syn. p. 218. |
| <i>Le Mulot,</i> | BUFFON, Hist. Nat. VII. p. 325, t. xli. |
| <i>Long-tailed Field Mouse,</i> | PENN. Brit. Zool. p. 120, No. 28. |
| <i>Wood Mouse,</i> | SHAW, Gen. Zool. II. p. 58, t. cxxxii. |

THIS common species, which is scattered over almost the whole of the temperate regions of Europe, is in every part considered as one of the most destructive of all the minor pests of the corn-field, the nursery-ground, and the kitchen-garden. Multiplying in hosts, and each one laying up a winter store in its subterranean retreat, the devastations committed by it are almost incalculable. It is, however, a gentle and timid little creature; easily

tamed, and rendered perfectly familiar. We have seen several of them running out upon the breakfast-table of our late most valued friend, Dr. Leach, of whose kind and affectionate disposition they appeared to have an almost instinctive perception, as they would feed from his hand, or from his plate, without the least fear, and allow him to handle and play with them as freely as the Dormouse. It frequently comes into houses on the approach of winter; and the largest we ever saw was taken in a mouse-trap in the larder at the Wakes, in Selborne. Its retreat is formed under ground, either in holes formed by its own labour, or more frequently in small natural excavations under the trunks or roots of trees, enlarged by themselves, or in the deserted runs of the Mole. The quantity of food which is here hoarded is astonishing: it consists of acorns, nuts, corn, and various seeds, or even roots; and, in addition to this immediate injury, "the great damage," says Pennant, "done to our fields by the Hogs rooting up the ground, is chiefly owing to their search after the concealed hoards of the Field Mice." Their depredations amongst early planted peas are often so considerable as to become a matter of serious consideration to the gardener, and several traps have been devised for their destruction. One of the most effective, and at the same time so simple in construction as to be easily within the reach of any one, is the following:—Two pegs are thrust firmly into the ground, and standing a few inches high, at such a distance apart as to admit of a brick being placed between them. A piece of twine is then taken, and a bean, which has been softened by soaking, is threaded upon it like a bead, and it is then extended between the two pegs, and firmly secured at either end to them, the bean being about the middle of the twine. The brick is then placed

between the pegs, in such a position that one end is supported by the twine, whilst the other remains upon the ground. The Mice, in eating the bean, which they will not fail to do, severs the string, and the brick falls upon them. Tiles or slates may advantageously be substituted for bricks, but they require that one be also placed upon the ground for a floor, as their weight would not be sufficient to destroy the Mice, if loose soil only were beneath. We have sometimes known nearly a dozen of these Mice taken in a garden by the above trap, in a single night.

When driven by hunger, they do not strictly confine themselves to vegetable food: they will eat various animal matters—young birds, or mice, or even each other, the smaller and weaker falling victims to the stronger.

It is very prolific, breeding in many instances more than once in the year, and bringing from seven to ten young at a time. “Un homme de ma campagne,” says Buffon, “en prit un jour vingt-deux dans un seul trou : il y avoit deux mères et vingt petits.”

There is no doubt that this species is the *Mus domesticus medius* of Ray, as is clearly shown by the following quotation:—“Caput longius quam in mure domestico minore vulgari, oculorum orbitæ ut et oculi majores et prominentiores ; auriculæ latiores et rotundiores.”*

The Long-tailed Field Mouse is too common in Europe to render necessary an enumeration of the countries which it inhabits. The following remarks by the Rev. Leonard Jenyns, would seem to point out a variety of this species which is found on the tops of the Irish mountains. He says: “One of these was taken in the county of Kerry, at an elevation of 2,500 feet above the sea-level. The only respects in which they differ from

the *Mus sylvaticus* are in being of a darker colour, smaller, and with some of the relative proportions rather less."* As we have ourselves observed considerable variation in size and colour, we can only regard these Irish examples as varieties of *Mus sylvaticus*.

The Field Mouse is larger than the Common Field Vole, but varies considerably in size; the head is long and raised; the muzzle tapering; the whiskers very long; the eyes remarkably large and prominent; the ears large, oblong, oval, with the anterior margin turned in at the base, and a projecting lobe arising within the ear near the base of the posterior margin; the tail nearly as long as the body, slender and tapering; the legs long. The upper part and sides of the head, neck, and body, and the outer surface of the legs of a yellowish colour, mingled with blackish, or of a yellowish brown, darker on the back; each hair being grey or ash colour at the base, then yellow, and the tips of some of them black; under parts whitish, with a very slight greyish tint in some parts, and a yellowish-grey patch on the breast. Tail brown above, white beneath.

Dimensions:—

	Inch.	lines.
Length of the head and body	4	2
„ of the head	1	2½
„ of the ears	0	7
„ of the tail	4	2
„ of the fore foot and claws	0	5
„ of the hind foot and claws	0	11

* Notes on some of the Smaller British Mammalia, &c., by the Rev. Leonard Jenyns, M.A., F.Z.S., &c. Annals of Natural History, Vol. VII. No. 44. June, 1841.

RODENTIA.

MURIDÆ.



COMMON MOUSE.

Mus musculus. (Linn.)

Specific Character.—Fur brownish ash colour above, light ash colour beneath; tail rather shorter than the body; ears about half the length of the head.

Mus musculus. LINN. Syst. Nat. Edit. XII. p. 83, sp. 13. PALL. Glic. p. 95. MULLER, Zool. Dan. Prod. p. 5, sp. 28. ERXL. Syst. p. 391, 5. DESMAR. Mammal. p. 301, sp. 178. FLEM. Brit. An. p. 19. JENYNS, Brit. Vert. p. 31.

„ *domesticus vulgaris s. minor.* RAY. Syn. p. 218.

Souris, BUFFON, Hist. Nat. VII. p. 309, t. xxxix.

Common Mouse, PENN. Brit. Zool. I. p. 122, t. xi. SHAW, Gen. Zool. II. p. 56, t. cxxxi.

THERE are few animals more generally associated with mankind, or whose very existence appears to be more essentially dependent upon human arts and human civilization, than this pretty but annoying little pest. Domestic in its habits, nourished by almost every article of human food, and obtaining effectual shelter in the secret recesses of the habitations which human art has raised, it has accompanied man in all his adventures for colonization, and identified itself with every new territorial occupation of our race. It is not in our houses, however, that the

devastations of the Mouse are most extensively felt. Multiplying in hosts, and safe from injury, they drill the whole interior of the wheat-rick, forming a labyrinth of its runs, and occasionally, perhaps assisted by the Harvest Mouse and the Field Mouse, make incalculable havoc amongst the grain. In the demolition of a single rick, several bushels of Mice have been destroyed, besides the numbers which must have escaped.

Their rate of increase will be evident from the fact that hundreds of Mice are sometimes found in a single rick, varying in some respects from ordinary examples. We remember on one occasion seeing great numbers killed in a wheat-rick at Welford-on-Avon, which were of a light grey colour, without the least mixture of brown. This rick, as far as our memory will serve us, had been standing for two years, and we entertained but little doubt that during that period one pair of Mice had produced the whole number, since, had the rick been frequented in the first instance by a greater number, some of them would doubtless have been ordinary brown Mice, and their progeny of the same colour. We have met with a similar instance in a wheat-stack at Welford Hill, but in this case all the Mice were of an unusually dark colour, especially along the dorsal line, which was nearly black.

But its astonishing multiplication may be more fully imagined from the following experiment of the great father of natural history:—"Having," says Aristotle, "placed a pregnant female of the Common Mouse in a closed vessel filled with grain, I found, after a short period, no less than a hundred and twenty Mice, all sprung from that single parent." This astonishing increase is easily accounted for. The Mouse breeds indifferently at all seasons, and several times in the course of the year, pro-

ducing ordinarily five or six young ones. In a fortnight the young are able to leave the mother, and assume an independent existence ; and at a very early age they also reproduce.

In addition to the usual means employed for their extermination, such as traps of various kinds, and the carnivorous instinct of the Cat, the Ferret, and the Weasel, there still exists in Wales a custom so disgustingly cruel, that the very mention of it would be scarcely pardonable but for the possibility of thus producing some degree of shame in the perpetrators of it, and consequently saving some poor little Mice from being the victims of such barbarity. It is customary in some parts of Wales to roast a Mouse alive, hanging it before the fire by its tail tied to a string, that its screams may scare the rest from the house.

It would be a useless expenditure of time and space to give in detail the localities which this well-known and widely diffused species is known to inhabit, but it may not be uninteresting to mention some of those which are most remote from its supposed native habitat. Dr. L. Von Schrenck includes it in his Mammals of the Amoor river. Mr. Darwin found it "living in short grass near the summit of the Island of Ascension," and again "on a small stony and arid island near Porto Praya, the capital of St. Iago, in the Cape de Verde Islands," also "on a grassy cliff on East Falkland Island." Mr. Waterhouse, speaking of specimens from the above localities, in his beautiful work on the Mammalia of the voyage of the *Beagle*, says: "These specimens are all of them rather less than full-grown individuals of the same species procured in England." We possess specimens collected by Mr. Fraser in the Republic of Ecuador, which, like the above-mentioned, are somewhat small in size.

There are several varieties of the Common Mouse. One of the most common, and which is perpetuated by breeding, is the *albino*, which is frequently kept as a pet. It becomes exceedingly tame, running about the table, and allowing itself to be taken in the hand without manifesting any alarm. Another variety, which is said to be common in India, is the Pied Mouse, the colours of which are dark brown and white. The Rick Mouse, or, as it is called in Scotland, the Barn Mouse, is larger and darker than the House Mouse; and we have specimens of the ordinary size, which are nearly black above, and very dark grey beneath, taken in Hertfordshire and Warwickshire.

Besides these, there is the pale grey variety, to which we have already alluded, and another which has the ordinary colour, more or less patched with white. Both of these, with a pale buff variety, which is not rare, have the black eyes of the Common Mouse, and are not therefore *albinoes*. Their peculiarity in colour is not, however, due to age, as examples may be found of all sizes.

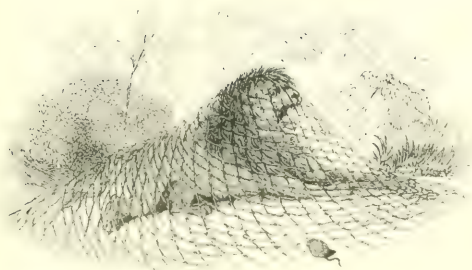
The English word *Mouse*, the Anglo-Saxon *Mus*, the German *Maus*, the Danish *Muys*, the Latin *Mus*, are all evidently modified from the Greek *Mûς*, which is probably derived from *μύειν*, to hide. The Italian *Sorice*, and the French *Souris*, are as obviously from the Latin *Sorex*, now employed in our systematic catalogues to designate the genus of the Shrews.

The head of the Mouse is taper, the muzzle rather acute; the ears and the eyes smaller than in *M. sylvaticus*, the former rounded, but shorter and narrower than in that species; the whiskers also are shorter, the tail less slender and flexible, and the legs rather shorter. The fur is greyish-brown above, grey beneath; ears, feet,

and tail, clothed with a small quantity of fine, soft, and short hair.

Dimensions :—

	Inch.	Lines.
Length of the head and body	3	6
„ of the head	0	11
„ of the ears	0	5
„ of the tail	3	4



RODENTIA.

MURIDÆ.



BLACK RAT.

Scoticè, RATTON.*Mus rattus*. (Linn.)

Specific Character.—Greyish-black above, ash colour beneath; ears half the length of the head; tail a little longer than the body.

Mus rattus,

LINN. Syst. Nat. Edit. xii. I. p. 83, 12. MULL.
Zool. Dan. Prod. p. 5, sp. 31. ERXLER. Syst.
p. 382, 2. DESMAR. Mam. p. 300, sp. 476. FLEM.
Brit. An. p. 20. JENYNS, Brit. Vert. p. 32. BLAS.
Faun. Deutsch. I, 317.

,, *domesticus major*, RAY, Syn. Quad. p. 217.*Rat*,

BUFFON, Hist. Nat. VII. p. 238, t. xxxvi.

Black Rat,

PENN. Brit. Zool. I. p. 113. SHAW, Gen. Zool. p. 32,
t. cxxx.

THE old English or Black Rat, which has now become a rare animal in this country, was, previously to the introduction of its more powerful congener and persecutor, the Brown Rat, as numerous and as extensively distributed as that species has since become. It does not,

however, appear that even the former was known here before the middle of the sixteenth century;—at least no author more ancient than that period has described or even alluded to it, Gesner being the first who described and figured it. Its smaller size renders it an unequal match for the Brown Rat, which, in the combats which famine occasions to take place between them, most usually comes off victorious; and to this circumstance, rather than to any real antipathy between them, may probably be ascribed the gradual diminution in their numbers, and the usurpation by the Brown Rat of the former haunts of the present species, which is indeed now rarely found, excepting in old houses of large cities, as in London, in Edinburgh, and in a few other places, where it still exists, but in very reduced numbers. Fifteen or twenty years ago this animal was not rare in several localities in Warwickshire, but we now doubt the possibility of obtaining a single example. To Colonel Drummond-Hay we are indebted for the following interesting notice of its occurrence in Scotland: “The year before last (1860), while staying in the Highlands in the vicinity of Pitlochry, a small colony of Black Rats made their appearance, occupying a drain which had been covered in about two years before. There were five or six pairs; they were very shy, and, I regret to say, all decamped as suddenly as they came, and they have never, as I learn, been observed since. My impression was that they were the old native Black Rat; and if so, the first I have ever heard of within the memory of any living person in the county.” In Ireland, as we learn from Dr. Kinahan, it is now very rare, although he informs us that he has formerly seen specimens from all the provinces, and remembers, not more than thirteen years since, seeing them at play in the areas in Dublin.

Although apparently verging towards extinction, it is probable, however, that it will continue to be occasionally met with, as, from its abundance in some countries, it is very likely to be conveyed in ships to our shores. It is equally destructive of every kind of food, whether consisting of animal or vegetable matters; and, not satisfied with the ordinary articles of human food, falls upon every organized substance within its reach, devouring even woollen cloths, leather, and other articles of domestic use. It forms its runs between the walls of houses, and under the stone and brick flooring of cellars, coming forth in the night in search of food. Its habits are, in fact, similar to those of the Brown Rat, of which most people have some idea.

In warmer climates, where there is no winter to interrupt their breeding, or to cut off their supply of nourishment, the multiplication of this species, as well as of the Brown Rat, is enormous; and they become in some seasons a most severe infliction upon the cultivators of the land.

Although its disposition appears to be naturally exceedingly ferocious, there are instances on record of its evincing considerable attachment, not only to each other, but to mankind. Mr. Jesse, in his usual amusing and pleasant style, gives us an anecdote, which the respectable authority from which he derived it would forbid us to doubt, exhibiting a degree of tenderness and care towards the disabled and aged members of their community, which, were it imitated by Christian men, would either render our poor laws unnecessary, or remove the disgrace and opprobrium which their maladministration too often causes to attach to them. His informant, the Rev. Mr. Ferryman, walking out in some meadows one evening, "observed a great number of Rats in the act of migrating from one place to

another, which it is known they are in the habit of doing occasionally. He stood perfectly still, and the whole assemblage passed close to him. His astonishment, however, was great, when he saw an old blind Rat, which held a piece of stick at one end in its mouth, while another Rat had hold of the other end of it, and thus conducted his blind companion." It appears also from several instances that this animal is not insensible of kindness, and that it may be powerfully attached to those who feed and caress it. Its motions are active and animated; it runs with great quickness, and leaps with agility and force. Like most of the genus, it can hold its food in the hands whilst eating, and it drinks by lapping. Its habits are cleanly; and its skin is ordinarily kept in beautiful order by the care with which it is cleaned,—an employment which occupies the greater part of its time, excepting when sleeping or eating. It breeds several times in the year, and the female brings ordinarily from seven to nine young. The nest is composed of grass, straw, and dried leaves, or of any other suitable material which they can obtain.

It is probable, from the proximity of the two countries, that it was introduced into England from France: indeed the Welsh name for it, which signifies "French Mouse," appears to favour this opinion. From Europe it has been sent with the Brown Rat to America, the islands of the Pacific, and to many other places, in some of which it has now become a serious inconvenience.

Of the *Mus Hibernicus* of Thompson, we can say but little, not having examined the types; the white spot on the breast, which has been thought distinctive, is certainly, however, of little value as a specific character, since we have seen two undoubted examples of *Mus rattus* in which it occurred. A considerable number of the latter

species were sent home by Mr. Fraser from Ecuador, which had the end of the tail and all the feet white. It will be evident, therefore, that the markings of white must be regarded as accidental, and not as indicative of specific differences.

The larger species of this genus, which are usually denominated *Rats*, differ in some trifling particulars from the *Mice*, and have by some naturalists been considered as constituting a distinct genus, of which opinion is our friend Mr. Hogg, who proposes for the former the generic term *Rattus*: there does not, however, appear to be a sufficient ground for such a separation. The present species is smaller than the Brown Rat; the head is more elongated; the muzzle taper and divided, and garnished with numerous long black hairs; the upper jaw projects far beyond the lower, which is remarkably short; the tongue is smooth; the nostrils open and crescent-shaped; the ears rounded, simple, naked, half as long as the head; the eyes large, not particularly prominent. The feet are decidedly plantigrade, with five toes on each; but the thumb on the anterior pair is concealed within the skin, excepting the terminal joint, with its claw. The soles of all the feet are tuberculated. The tail longer than the body, almost without hair, and covered with numerous rings of scales. Colour of the upper parts greyish-black, sometimes brownish-black, and we have seen a few specimens in which the back has been of a dark brownish-grey, and their resemblance to the *Mus alexandrinus** has been very remark-

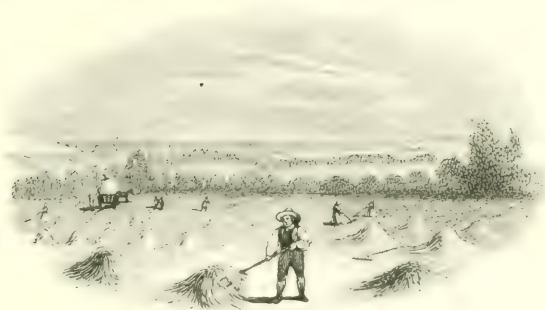
* An interesting paper was published by M. A. de l'Isle in the "Annales des Sciences Naturelles" for 1865, detailing the results of a long series of experiments on the inter-breeding of *M. rattus* with the *M. alexandrinus* of Southern Europe. M. de l'Isle arrived at the conclusion that these two forms must be regarded merely as geographical races of one species, and considered *M. alexandrinus* to be the oldest, or parent breed.

able: the lower parts are dark ash colour: feet and tail dusky.

Dimensions:—

	Inch.	Lines.
Length of the head and body	7	0
„ of the head	1	9
„ of the ears	0	10
„ of the tail	7	6
„ of the fore foot and claws	0	8 $\frac{1}{4}$
„ of the hind foot and claws	1	4 $\frac{1}{4}$

In conclusion, we may remark that the black variety of the Water Vole, to be described hereafter, is not unfrequently mistaken for the true Black Rat, for which we have seen it doing duty in several local museums.





BROWN RAT.

NORWAY RAT.

Mus decumanus. (Pall.)

Specific Character.—Greyish-brown above, whitish beneath; ears one-third the length of the head; tail shorter than the body.

- Mus decumanus*, PALLAS, Glir. p. 91. GMEL. Syst. Nat. Linn. I. p. 127.
 DESMAR. Mammal. p. 473, sp. 473. FLEM. Brit. An.
 p. 20. JENYNS, Brit. Vert. p. 32. BLAS. Wirbelt. Deutsch.
 I. p. 313.
- „ *norvegicus*, BRISSON, Reg. An. p. 173. ERXLEB. Syst. p. 381, 1.
- Surmulot*, BUFFON, Hist. Nat. VIII. p. 206, t. xxvii. FR. CUVIER,
 Mammal. I.
- Norway Rat*, PENN. Brit. Zool. I. p. 115. SHAW, Gen. Zool. II. p. 51,
 t. cxxx.

THE geographical distribution of animals, although a subject of great interest, and one which has of late years occupied the attention of many eminent zoologists, is not yet sufficiently understood to furnish any very well-defined laws, either with reference on the one hand to

organization and habits, or, on the other, to zoological classification. There are, it is true, certain groups which are strictly confined within the boundaries of a particular tract of country; there are some, the habitations of which are evidently regulated by climate, by soil, or by the necessity of a particular kind of food; whilst others appear to be located with very little regard to any obvious object. Some individual species, again, are found but in one small corner of the globe, where they exist, perhaps, in inconsiderable numbers; whilst others, capable of procuring their nourishment from the products of every region, and readily transplanted by means of the commercial intercourse of various nations, become naturalized in every new colony to which they have been accidentally transported, and at length identified with the original natives of their adopted country. Of those which fall within the scope of the latter observation, there are none to which it applies with more force than to the common Brown Rat, which is now so generally distributed wherever man has planted his foot, that its original country can no longer be ascertained, although there is reason to believe that it comes from a warmer climate than our own. It was doubtless brought hither by means of merchant vessels from some southern or south-eastern country—Pennant imagines from the East Indies. It certainly was known in Asia long before we have any account of its existence in any part of Europe; and its transit from the Asiatic borders into European Russia was well ascertained. In Paris it made its appearance about the middle of the eighteenth century, and in England not very many years earlier. It is by a strange mistake called by many the Norway Rat, as if it were aboriginal in that country; whereas in fact, at the time when the name was first applied to it, it was not known

even to exist there. Its astonishing fecundity, its omnivorous habits, the secrecy of its retreats, and the ingenious devices to which it has recourse, either to retain its existing place of abode, or to migrate to a more favourable situation, all conduce to keep up its almost overwhelming numbers. It digs with great facility and vigour, making its way with rapidity beneath the floors of our houses, between the stones and bricks of walls, and often excavating the foundations of a dwelling to a dangerous extent. There are many instances of their fatally undermining the most solid mason-work, or burrowing through dams which had for ages served to confine the waters of rivers and canals. The most remarkable instance, however, which we have met with of the extent of their subterranean ravages, their multitudinous numbers, and their almost incredible consumption of food, is contained in the following narration:—

It is not very long since an official report was made to the French Government, with reference to a “proposition made for the removal of the Horse slaughter-house at Monfaucon to a greater distance from Paris; when one of the chief obstacles urged against such a removal, was the fear entertained of the dangerous consequences that might result to the neighbourhood from suddenly depriving these voracious vermin of their accustomed sustenance. The report goes on to state that the carcasses of the Horses killed in the course of a day (and sometimes these amounted to thirty-five) are found the next morning picked bare to the bone. Dusaussais has, however, made a still more conclusive experiment. A part of his establishment is enclosed by solid walls, at the foot of which are several holes made for the ingress and egress of the Rats. Into this enclosure he put the carcasses of two or three Horses; and, towards the middle of the night,

having first cautiously, and with as little noise as possible, stopped up all the holes, he got together several of his workmen, each having a torch in one hand and a stick in the other. Having entered the yard and closed the door behind them, they commenced a general massacre. It was not necessary to take any aim, for no matter how the blow was directed, it was sure to immolate a Rat; and those which endeavoured to escape by climbing up the walls were quickly knocked down. By a recurrence of this experiment at intervals of a few days, he killed in the space of a month 16,050 Rats. After one night's massacre the dead amounted to 2,650; and the result of four hunts was 9,101. Even this can give but an imperfect idea of the number of these vermin; for the enclosure in which they were thus killed contains not above the twentieth part of the space over which the dead bodies of Horses are spread, and which, it is but fair to suppose, must equally attract the Rats upon all points. These animals have made burrows for themselves, like Rabbits, in the adjoining fields, and hollowed out into catacombs all the surrounding eminences—and that to such an extent, that it is not unusual to see the latter crumble away at the base, and leave these subterraneous works exposed. So great is the number of these animals, that they have not all been able to lodge themselves in the immediate vicinity of the slaughter-houses; for paths may be distinctly traced leading across the fields from the enclosures in which the Horses are killed, to a burrow about 500 paces distant.”*

The following remarkable instance of the ferocity of this animal, when driven by hunger, was related to us by the late Robert Stephenson, Esq., M.P., the distin-

* See Jesse's Gleanings, Second Series, p. 311.

guished engineer: In a coal-pit (Walker Colliery, near Killingworth), in which many horses were employed, the Rats, which fed upon the fodder provided for the Horses, had accumulated in great multitudes. It was customary in holiday times to bring to the surface the Horses and the fodder, and to close the pit for the time. On one occasion when the holiday had extended to ten days or a fortnight, during which the Rats had been deprived of food, on reopening the pit, the first man who descended was attacked by the starving multitude, and speedily killed and devoured.

When they determine to leave a particular building, to which they are generally instigated either by the cessation of a sufficient supply of food, or, as it is proverbially stated, when any ruinous injury is found to exist in its masonry, they emigrate in a body, and by night; and woe to the devoted structure to which they attach themselves! They speedily commence their excavations, and in a short time become so completely established, that nothing short of famine can again dispossess them. They are bold and ferocious when attacked, or when confined in a room with either a human being or a Dog; flying with the most reckless fury at the object of their fear or anger. If several be enclosed in a box together, they fight furiously, and the weaker is not only killed, but devoured by the stronger. The Rat swims with great ease. The gardens of the Zoological Society of London, in the Regent's Park, are greatly infested by them; but as they are too cunning to risk the danger of being caught during the daytime, or alarmed, perhaps, at the concourse of persons by whom the gardens are frequented, they are often seen towards evening crossing the canal in a body from the opposite shore, in order to land

in the gardens, and enjoy their night's depredations, returning in the morning in the same manner to their daily retreat.

We are indebted to Mr. Stephenson also for the following remarkable illustration of the habits of these animals and their prodigious fecundity:—In the year 1816 or 1817 a Prussian vessel was wrecked on the S.W. side of Puffin Island on the coast of Wales. The island takes its name from the multitudes of Puffins which frequented it, and it was also colonized by vast numbers of Rabbits. No annoyance had ever been experienced from Rats until the occurrence above mentioned took place; but after that, in consequence of the migration of these animals from the wreck to the shore, and their subsequent rapid increase, the Rabbits were almost, if not wholly, exterminated, the Puffins were ejected by the destruction of their eggs by the Rats, and the parties who rented the island gave up their holdings. A similar instance has come within the knowledge of Mr. Pattisson, who has kindly supplied us with the following, which we give in his words:—"When visiting the Copeland Islands, in Belfast Bay, in August, 1860, Captain Nesbitt, one of the elder brethren of the Trinity House, related the following fact. In 1815, when the Trinity House bought up all the private lighthouses round the coast, the Skerries, near Holyhead, had immense numbers of Rabbits, which were extensively used by the lighthouse keepers. A few years ago an American vessel was wrecked there, on board of which were a number of Rats. These swam to the shore. They have now increased prodigiously in numbers, have destroyed the wild Rabbits, and are obliged to live in a great degree on the shell-fish of the shore. The lighthouse men not only have lost the wild Rabbits, but find

a difficulty in rearing any tame ones, because of the attacks of the Rats."

The habits of the Brown Rat are thus generally similar to those of the Black Rat. They are even more prolific, breeding several times in the year, and producing as many as ten, twelve, or fourteen at a birth. It would be easy to multiply facts and anecdotes of this curious animal; but enough has been said to exhibit it as a sagacious, bold, and annoying plague, whose extirpation is provided against by these qualities, as well as by its astonishing fecundity.

The best mode of destroying the Rat is by means of the traps first employed by Mr. Board, whose plan is detailed in a little work written for the purpose. This plan has been adopted in the Zoological Gardens with great success.

Rats feed on every article of household consumption; and they also make great havoc in the fields with corn, beans, and other grain and pulse, of which, after eating their fill, they carry off a large quantity, and deposit it in their runs. They are also sad depredators in the poultry-yard and game-preserves, devouring numbers of eggs and young, both of domestic poultry and of game.

The Brown Rat considerably resembles the old English or Black Rat; it is, however, somewhat larger: the head is less elongated; the muzzle less acute; the ears smaller; the tail comparatively much shorter. The ears and muzzle are nearly naked; the tail with about one hundred and eighty scaly rings, each scale having a small hair or two growing from beneath it. Colour of the upper parts greyish-brown with a tawny tint, resulting from each hair being dusky grey at the roots, and yellowish-brown at the extremity; a few stiffer blackish hairs are also

scattered amongst the others: the under parts are a dirty white.

Dimensions:—

	Inch.	Lines.
Length of the head and body	9	0
“ of the head	2	4
“ of the ears	0	8
“ of the tail	7	5
“ of the fore foot and claw	0	9
“ of the hind foot and claws	1	6½



Genus *Arvicola*. (Lacép.)

VOLE.

Generic Character.—Grinding-teeth $\frac{3}{3}$, deeply sulcated externally; muzzle obtuse; toes separate; tail round and hairy, shorter than the body.

WATER VOLE.

WATER RAT.

Arvicola amphibius. (Desmar.)

Specific Character.—Greyish-brown, with a reddish or yellowish tinge; paler beneath; sometimes of a uniform black all over. Tail about one-half the length of the body, or even less. The second upper grinder has four cemental spaces and five angles; the third has five spaces, imperfectly separated, and seven angles.

Mus amphibius,

„ *aquaticus*,

„ *terrestris*,

Lemmus aquaticus,

Arvicola amphibius,

„ *amphibia*,

„ *aquatica*,

LINN. Syst. Nat. edit. xii. I. p. 82. MULL. Zool.

Dan. Prod. p. 5, sp. 30. ERXLEB. Syst. p. 86, 3.

BRISSON, Reg. Anim. p. 175.

LINN. Syst. Nat. Edit. xii. p. 82.

FR. CUVIER, Dict. des. Sc. Nat. VI. p. 306.

DESMAR. Mammal. p. 280, sp. 435.

JENYNS, Brit. Vert. p. 33.

FLEM. Brit. Ad. p. 23.

<i>Arvicola musignam</i> ,	DE SELYS, Rev. Zool. 1839.
„ <i>monticola</i> ,	DE SELYS, Rev. Zool. 1838.
<i>Rat d'eau</i> ,	BUFFON, Hist. Nat. VII. p. 368, t. xliii.
<i>Water Rat</i> ,	PENN. Brit. Zool. I. p. 118. SHAW, Gen. Zool. II. p. 73, t. cxxix.
Var. β , deep black above and beneath.	
<i>Arvicola ater</i> ,	MACGILLIVRAY, Trans. Wern. Soc. VI. p. 424.

IN the former edition of this work we conformed to the prevailing opinion that the *Arvicole* could not with propriety be placed with the Mice, but that they constituted an aberrant group of the Beavers, and acting under this impression, the patronymic name of *Arvicolidæ* was made to give way to that of *Castoridæ*. But the able researches of our friend Mr. Waterhouse have shown us that this conclusion, although sanctioned by the opinion of former writers, as well as by a certain general external resemblance between the animals of the two groups, is directly at variance with their osteological characters, and these, as clearly made out by Mr. Waterhouse, constitute the only sure basis for the classification of this difficult order of Mammals. The views which that gentleman entertains respecting the position of the *Arvicole* will be best given in his own words. Alluding to the genera *Ondatra*, *Arvicola*, and *Lemmus*, represented respectively by the American Muskwash, the Voles, and the Lemmings, he says: "The animals comprising these groups have all the essential characters of the *Muridæ*, but differ in having rootless molars, and in the form of the lower jaw. They have, moreover, some peculiarities in the structure of the cranium, which have been pointed out. Here all the characters alluded to are combined with three true molars, the normal number in the *Muridæ*, and may be conveniently used to define the *Arvicolidæ* as a sub-family of that group. In my paper on the *Arvicolidæ* I had placed in that section, besides the

three genera above mentioned, two others, *Ascomys* and *Castor*."

In the opinion here expressed by our talented friend we fully concur, but as confirmation we may bring before the notice of our readers the existence of a genus of Rodents peculiar to America, in which a Rat-like form and long tail is combined with rootless molars, as in the Voles. It is the genus *Neotoma*, and is found in the Southern States of North America, and in Central America. But there is one British Rodent even, which may be properly instanced as indicating a passage from the Voles to the true Rats. We allude to the Bank Vole, in which, on reference to the figure, the tail will be seen to be of greater relative length than in the other two species, and with this is associated a somewhat narrower cranium, and molars which become rooted with age, though the roots are never so well developed as in the true Rats or Mice.

The Water Vole, or, as it is more frequently called, the Water Rat, is found in most parts of Europe, and is too common to require further comment, excepting to mention that in certain localities it varies sufficiently from its usual appearance to have led to the belief that it was a distinct species. Thus a small variety from the Alps has been described as *A. terrestris*, and a pale one from the Pyrenees has been called *A. monticola*, whilst in our own country, a black variety has received the name of *A. ater*. In its geographical range, however, the Water Vole is not wholly confined to Europe, but has been met with in China; in the vicinity of the River Amoor it was found by Dr. Von Schrenck, as we learn from his work on the Mammalia of that district. In this country it is very common; frequenting the banks of rivers, excavating its habitations to a considerable distance, and breeding in these

subterranean caverns. It dives and swims with great facility, instantly seeking the water upon every alarm, and plunging at once to the bottom; from whence, however, it is obliged to return to the surface for respiration about every minute. It has often been asserted that the Water Vole lives upon small fish, earthworms, and insects, and it has even been accused of destroying young ducks. There is not, however, the slightest foundation for this opinion; and there can be no doubt that the belief of its carnivorous habits has arisen from its being confounded with the common Brown Rat, *Mus decumanus*, which is well known to frequent the banks of ditches, and to feed readily on almost all animal substances, attacking even the smaller animals alive, when driven by hunger: and it is, in fact, in the organization essentially connected with these different habits and propensities, that the characters of the two families principally consist.

We have often watched with great interest the movements of the Water Vole when in search of food, which, we have every reason to believe, consists exclusively of vegetable substances. A decided preference is shewn during the summer months for the inner or concealed parts of some species of sword-flags, which is very succulent and sweet-tasted. As this portion is usually below water, the animal gnaws the plant in two near its root, when it rises to the surface, and being conveyed to some sound footing, is consumed at leisure. In default of its more favourite food, it will make a satisfactory meal on the common duckweed, the verdant summer mantle of our stagnant ponds and moats. Only the green and fleshy leaf is eaten, the roots and other fibrous parts being rejected. While feeding on this plant, the creature sits, like a squirrel, on its haunches, near the water's edge, and taking up a lump of the soft and slimy-looking

mass in its fore-paws, eats a small part only, and letting the remainder fall, takes up some more in the same manner, which is similarly treated and rejected. But it is not at all seasons that food can be obtained in such abundance, and, unlike the crafty inhabitants of our houses and granaries, the Water Vole suffers great privations during severe winters, when the streams are frozen up or continuously flooded. At these times, we have known turnips and mangold-wurzel to take the place of aquatic plants, and the bark of willow-trees and osiers is not rejected. As considerable damage is sometimes sustained by the owners of osier beds, owing to the depredations of the Water Vole in times of scarcity, a war of extermination is carried on, and great numbers are destroyed during protracted floods. Their holes, usually so secure, are then inaccessible, and they are compelled to take shelter in covert, which is only sufficient to conceal them, and from which they are readily dislodged by dogs. Old willow-trees, at these times surrounded by water, afford a favourite and comparatively safe retreat, but a volley of stones is generally found sufficient to frighten the animal into the water, and on its reappearance at the surface,—for it almost invariably dives when alarmed,—it is either shot or hunted by dogs. Notwithstanding that great numbers are in this manner destroyed, so secure are they in their summer retreats, when the business of propagation is going on, that their numbers appear to be again made up, and we do not perceive that they become rarer from year to year.

The female produces five or six young in the month of May or June ; sometimes as early as April, in which case it is probable they will have another brood in the course of the summer.

The head of this animal is thick, short, and blunt ;

the eyes small, and not very prominent; the ears short, scarcely conspicuous beyond the fur; the cutting teeth of a deep yellow colour in front, very strong, chisel-shaped, considerably resembling those of the Beaver; the surface of the grinding teeth formed of alternate triangles arranged on each side of the longitudinal axis. In all the Voles the flat crowns of the grinders are divided by the folding of the enamel into a number of triangular cemental spaces or hollows, and the number and form of these have been shown by Blasius and others to afford good specific characters. In the present species the second upper grinder has four spaces and five external and internal angles; the third has five spaces, of which the two last are sometimes joined, and seven angles; the first lower grinder has seven spaces and nine angles. Fore feet with four complete toes, the last phalanx only of the thumb being conspicuous beyond the skin; hinder feet with five toes, not webbed, though connected to a short distance from the base; tail more than half the length of the body, covered with hairs, of which those on the inferior surface are rather long, and probably assist the animal in swimming by forming a sort of rudder of the tail. Fur thick and shining; of a rich reddish-brown mixed with grey above, yellowish grey beneath.

Dimensions:—

	Inch.	Lines.
Length of the head and body	8	4
„ of the head	1	10
„ of the ears	0	5
„ of the tail	4	8

A black variety of this species has long been known, and has been described by Pallas, and by several other Continental zoologists. It is identical with the animal described by Mr. Macgillivray in the sixth volume of the

Transactions of the Wernerian Society of Edinburgh, under the name of *Arvicola ater*. According to that gentleman's account, it is exceedingly common in the counties of Banff and Aberdeen; and it is said that the common Water Vole is not found where this one abounds. Its habits are similar to those of the former. It is of a deep black colour above, and black with a greyish tinge beneath, and it is smaller than the brown one; but the proportions are not conspicuously, if at all, different. This black variety is common in many parts of Scotland, and Mr. Jenyns states that it "is not uncommon in the fens of Cambridgeshire, and differs in no respect from the other but in colour." We are informed by our friend Professor Newton, that it is common in the neighbourhood of Thetford in Norfolk, and it has been met with in several other parts of England.



RODENTIA.

ARVICOLIDÆ.



COMMON FIELD-VOLE.

Arvicola agrestis. (Linn.)

Specific Character.—Greyish-brown, beneath pale grey, feet dusky. Tail only one-third the length of the body. The second upper grinder has five spaces and six angles; the third six spaces and eight angles; the first lower grinder nine spaces and eleven angles.

Mus agrestis, LINNÆUS, Faun. Suec., II. 11, No. 30.

„ *gregarius*, „ Syst. Nat. I., 84, No. 16.

Arvicola agrestis, DE SELYS, Bul. Acad. Brux., 1840.

THIS species was first described by Linnæus, but was afterwards generally confounded with the common Vole of the continent, and thus *A. agrestis* and *A. arvalis* are constantly given as synonymous, although the animals are very distinct in nature. *A. agrestis* may always be distinguished by the character of its second upper molar, which has *five* cemental spaces, whereas the same tooth in *A. arvalis*, as in all the other European Voles, has only *four* spaces. It seems not a little strange that the last-named

species, which is so abundant throughout all Central Europe, should never yet have been found in Britain, and the fact is rendered still more curious by the discovery of its teeth in a semi-fossil condition in fissures of the limestone rocks near Bath, whence we have had the pleasure of examining specimens, thanks to the kindness of our friend Dr. H. Blackmore of Salisbury. That gentleman has paid much attention to the *Arvicolidæ* of the drift formations of Wiltshire and Somerset, and has distinguished several interesting species, including the Alpine *A. nivalis* and the Northern *A. ratticeps*.

The Common Field-Vole is a native of Northern and Central Europe from Scandinavia, where it extends to about 66° north latitude, to the Alps and Pyrenees; but it is more plentiful in the northern countries than in the more southern, where it is much exceeded in numbers by *A. arvalis*. Blasius received it from Finmark, North Russia and Denmark, as well as from various parts of Germany, and M. Fatio finds it in Switzerland up to a height of 4,000 feet. In our own islands it is very abundant from the Orkneys to the Isle of Wight, but, like the rest of the genus, it is unknown in Ireland.

It is usually but not exclusively found in damp places, whence its local names of "Meadow-mouse" and "Water-mouse"; in autumn Blasius has found it established in an old nest of the Coot (*Fulica atra*) in company with the Water Shrew. It forms burrows of considerable extent, as well as more superficial runs among the roots of the grass and herbage, and it may be seen abroad at all seasons of the year and at all hours of the day, though it is most active towards nightfall. We have repeatedly kept it in confinement, and have found that it soon becomes tame, without exhibiting much familiarity or attachment. It climbs with ease, an

accomplishment which enables it in winter to feed on the bark of various trees and shrubs, especially on that of apple and pear trees. In winter we have occasionally taken it in cellars and out-houses. An interesting account of its habits as observed in Switzerland will be found in M. Fatio's valuable monograph of "*Les Campagnols du Léman.*"

The ordinary food of this species consists of all sorts of roots and herbage; in case of hunger it will eat flesh, and even prey on its own species. In captivity we have found it to be partial to insects, but not in such a marked degree as the Red Field-Vole.

The nest is a rounded structure of moss and leaves, usually placed amongst the roots of grass in a hollow on the surface of the ground. The young are four to six in number, and there are three or four broods in the year, so that the rate of increase of the species is very rapid. This is counteracted by many opposing checks, chief amongst which are the great numbers which fall victims to the smaller beasts and birds of prey, notably to the Weasel, the Kestrel, and the Owls, which thus prove themselves the best friends of the farmer. Many, too, are drowned in their burrows during floods, and on the other hand a great mortality takes place in very dry seasons. Occasionally they increase to a wonderful extent, and prove most destructive enemies to the farmer and the forester. Such an abnormal multiplication took place many years ago in the New and Dean Forests, when great numbers of young trees were destroyed. Mr. Jesse estimated that not less than two hundred thousand Voles were killed in the two forests, but some of these probably belonged to the next species.

The Common Field-Vole has the head large, the muzzle very blunt, and the eyes small. The ears just appear

above the fur, and are lined with fine hairs, whereas in *A. arvalis* the inside of the conch is naked. The colour is greyish-brown, the flanks being more or less tinged with reddish or yellowish; the under parts are pale grey or dirty white, and the feet are dusky. The young are darker in colour than the adults. The tail measures about one-third the length of the body, is sparingly clad with hair, and is obscurely bi-coloured, being brown above and greyish beneath.

In the skull the frontal portion is much narrowed in the adult animal. The second upper molar has five cemental spaces and six angles, a character which, as already stated, separates this species from all the other European Voles; the third has six spaces and eight angles, and the first lower molar has nine spaces and eleven angles. Slight variations occur in the pattern of these teeth, but they are not constant, and are not even always the same on both sides of the same skull.

Dimensions :—

	Inch.	Lines.
Length of the head and body	4	1
„ of the head	1	2
„ of the ears	0	5
„ of the tail	1	3½

Two Voles described as British have been referred to this species by Blasius and other recent writers. These are the *A. neglecta* of Thompson (*Ann. and Mag. Nat. Hist.* 1841), and the *A. britannicus* of De Selys Longchamps (*Revue Zool.*, 1847); the characters on which their distinction was founded were merely external differences of tint and proportions, which cannot in the least be depended on in so variable and difficult a family as the Voles.

RODENTIA.

ARVICOLIDÆ.



RED FIELD-VOLE, OR BANK-VOLE.

Arvicola glareolus (Schreber).

Specific Character.—Back rich reddish-chestnut, flanks grey, lower parts and feet nearly pure white. Tail about one-half the length of the body, hairy, dark brown above and white below. Upper grinders with double roots in the adult. The first upper grinder has four spaces and five angles, the second six spaces and eight angles; the first lower grinder has seven spaces and nine angles.

<i>Mus glareolus</i> ,	SCHREBER, Säugeth. III. 680.
<i>Arvicola pratensis</i> ,	BAILLON in F. Cuv. Mamm. IV.
„ <i>riparia</i> ,	YARRELL, Proc. Zool. Soc. 1832, 109.
„ <i>rufescens</i> ,	DE SELYS, Campag. de Liège, 13.
„ <i>bicolor</i> ,	FATIO, Rev. et Mag. Zool. 1862.

THE Bank-Vole, or as it may be better named, the Red Field-Vole, was first noticed by Pallas (*Nor. Spec. Glires*, p. 247) as a variety of his *Mus rutilus*, and was first separated as a distinct species in Schreber's great work on the Mammalia. It has since received various other names, owing to its variability in colour and proportions. It may be readily distinguished from the other smaller European Voles by the red colour of its back,

the length of its tail and the pattern of its teeth. The fact of its upper grinders having double roots in the adult has led Blasius and others to separate it as a subgenus under the name of *Hypudæus*.

The Red Field-Vole is widely spread throughout Europe north of the Appenines, extending northwards to the Arctic Circle and eastwards to the Ural Mountains. In Britain it was first discovered in Essex by the late Mr. Yarrell, who described it as a new species, under the name of *A. riparia*, in the "Proceedings of the Zoological Society" for 1832. It appears to be very generally but somewhat locally distributed over the whole island. We have not yet seen specimens from the extreme north of Scotland, but it extends at least as far north as Morayshire, whence it has been sent us by our friend the Rev. G. Gordon, and south of this it seems to occur in every county of Scotland and England, being perhaps more plentiful in the northern than in the southern districts.

In its habits this species much resembles the Common Field-Vole, but it may be described as being more bold and active, more omnivorous in its diet, and less fossorial in its habits. It frequents drier and more wooded localities, and appears to be especially fond of gardens, where it is often very destructive to fruits and roots. It does not burrow so extensively as *A. agrestis*, often contenting itself with runs or galleries through the matted grass or herbage, or with crevices among stones or rocks. We have repeatedly kept it in captivity, and had one which lived for several months. They soon became tolerably fearless, but could never be said to be really tame or familiar. They were even more frequently abroad during the day than the common species, but still were most active at dusk. Upon being supplied with fresh branches of trees they showed great agility in

climbing, biting off the leaves and young shoots for food.

This Vole, like the other species, feeds on various vegetable substances, but it is much more partial than its congeners to animal food, as might be expected from its more murine character. In captivity it prefers roots and fruits to herbage; gooseberries are a special delicacy and are very neatly emptied of their contents, the skins being always rejected. In Morayshire Mr. Gordon says that these Voles are very destructive to young larch-trees, climbing the branches to feed on the young buds, and also barking the stems in winter. They do not reject carrion, and feed freely on insects, worms, snails, &c.; the wings of the former being always cut off before the body is eaten. They even attack young birds, for M. Fatio has often known them to plunder the nests of Hedge-sparrows and Robins; and we have known one kill and devour a Common Shrew which was confined in its company.

The nest, like that of the Common Field-Vole, is placed in a hollow on the surface amongst thick herbage. It is built of grass and moss, and M. Fatio has sometimes found it lined with feathers. The young vary in number from four to eight, and there are said to be three or four litters in the year.

This is a much prettier species than the Common Field-Vole, its proportions being more elegant, its colours brighter, and its fur more smooth and glossy. The head is narrower and less flattened, the eyes larger and more conspicuous, and the ears longer, so as to show distinctly above the fur. The head and back are rich chestnut, which passes on the flanks into a more or less clear grey, while the breast, belly, and feet are almost pure white. The young are much darker in colour than the adults.

The tail is about one-half the length of the body, and is thickly clad with rather long hairs which form a tuft or pencil at the end; it is dark brown above and white below, the two colours being clearly separated.

In the dentition the most remarkable peculiarity, to which we have already alluded, is the development in the adult of distinct roots to the molar teeth. The first upper grinder has four cemental spaces and five angles, the second has six spaces and eight angles, and the first lower grinder has seven spaces and nine angles.

The following measurements in inches and decimals are an average taken from a number of specimens of both sexes:—

					Males.	Females.
Length of head and body	.	.	.	.	3.50	3.40
„ of head	.	.	.	.	1.10	1.08
„ of ear	.	.	.	.	.40	.40
„ of tail	.	.	.	.	1.54	1.50
„ of hind foot	.	.	.	.	.62	.58

This species is liable to considerable variation in colour not only in individuals, but in the races which inhabit different districts. Thus the Alpine form, in which the grey tint predominates over the red, has been separated as *Hypudæus nageri* of Schintz, and the opposite extreme in which the grey is almost absent as *Myodes bicolor* of Fatio. But these forms are not constant and pass one into the other, as has been shown by Blasius and by M. Fatio's later researches.

RODENTIA.

LEPORIDÆ.

Genus, *Lepus* (Linnæus).

Generic Character.—Hind-legs and ears long; tail short, turned up. Grinding-teeth $\frac{6}{5}:\frac{6}{5}$, with flat crowns, the folds of enamel transverse; incisors grooved, four in upper jaw, two in front, and two small immediately behind them.

COMMON HARE.

Lepus timidus. (Linn.)

Specific Character.—Upper parts and flanks tawny grey, more or less mixed with reddish, purer grey in winter; belly white; tail nearly as long as the head, black above, white beneath; ears longer than the head, black at the tips. First upper grinder with a single internal angle.

Lepus timidus, LINNÆUS, Syst. Nat. I. 77.

„ *europæus*, PALLAS, Nov. Spec. Glir. 30.

THE genus to which this animal belongs is one of the most natural in the whole of the Rodentia. It is characterized by numerous striking and well-marked peculiarities. The incisive teeth are numerically different from those of all the rest of the order; in addition to the two long, curved, chisel-shaped teeth above and below, there are added in the upper jaw two smaller ones, placed im-

mediately behind the normal pair and concealed by them; the upper incisors are flat and longitudinally grooved in front, while those of the lower jaw are somewhat wedge-shaped. The grinders are formed for the mastication of vegetable food only, being constantly worn down, and as constantly growing from beneath, as in the Beavers (*Castoridae*) and the Porcupines (*Hystrioidae*); the worn surfaces are uneven and the projecting laminae of the enamel transverse. The ears are long in all the species; the eyes large, prominent, and placed laterally; the hind legs, especially in the typical Hares, much longer than the fore legs; the feet hairy, and the tail short and turned up. The teats are both pectoral and inguinal. The usual colour is a mixture of grey and reddish-brown; in some the prevailing colour is fulvous, while in others the grey predominates. The admirable wisdom which has assigned such colours to a group of defenceless animals which conceal themselves amidst the brown sombre vegetation of woods and heaths, will appear more striking when it is recollected that certain species, inhabiting the snowy regions of the north, become wholly white in winter. All the members of the genus are remarkable for their timidity, and their whole structure is such as at once to announce to them the presence of danger, and to enable them to escape from it; the ears and eyes are so formed and situated as to become instantly cognizant of even distant warnings of peril, and the limbs are admirably adapted for the most rapid flight.

With all these similarities, however, there are great diversities in the habits of the different species. Whilst the Rabbit excavates a burrow to a considerable depth, whither it instantly betakes itself on the approach of danger, the Hare makes but a superficial depression, called its *form*, which it uses as a resting-place, and

trusts for its safety to the rapidity and duration of its course.

The Common Hare, the type of the family, is widely distributed throughout the continent of Europe, reaching from the south of Sweden and the north of Russia to the Mediterranean and the Caucasus; according to Pallas it is not found in Siberia. Within the above limits it is subject to considerable variation, and has consequently been separated into several distinct species. But although the extreme forms appear sufficiently distinct, yet they are connected by so many intermediate links, that Prof. Blasius, after examining a great number of specimens from different countries, regarded them merely as climatic or geographical forms, and divided them into three principal races. These are—the *north-eastern* (including the so-called species *L. caspicus* of Ehrenberg, *L. medius* of Nilsson, and *L. aquilonius* of Blasius himself), distinguished by its thick fur and its inclination towards turning white in winter; the *central*, with moderate fur and a considerable increase of grey in winter; and the *southern* (including *L. mediterraneus* of Wagner, *L. meridionalis* of Gén  , and *L. granatensis* of Schimper) with thin fur, scantily-clad ears, and a maximum of red in its colouration. An examination of specimens of each of these forms leads us fully to agree in the conclusions of the great German zoologist.

In Britain the Common Hare is found throughout the whole island, and owing to its preservation as game it is extremely abundant in many parts; it is not found, however, in any part of Ireland, where its place is taken by the next species. It is comparatively rare in the extreme north of Scotland, but is found in the low grounds and valleys even in Sutherlandshire and Caithnessshire. Messrs. Baikie and Heddle inform us that it was introduced into

the Mainland of Orkney in 1832, and has become very numerous there and in Hoy; it is also found in the Inner Hebrides and in the Isle of Wight.

The Hare is an evening feeder; having made its form it remains in it during the day, leaving it only towards nightfall, and constantly returning to it, after the most extensive travels; hence it is proverbially said that the wounded Hare returns home to die. It changes its situation, however, according to the season, selecting in the summer a shady spot, and in the winter an aspect where it may receive the benefit of the sun's rays. Hares are usually to be found in cover during rain, and in the open in fine weather; on some days they must be sought for among long grass and herbage, on others on almost naked fallows and ploughed fields. Sometimes they remain in their forms till one almost tramps on them, whilst at other times, especially in bad weather, they take to flight long before the sportsman gets within gunshot; they are usually much wilder in the afternoon than in the morning. The Hare swims well and takes to the water readily—not merely when pursued, but to obtain a more plentiful supply of food, and the male will often cross a river in search of a mate; an account of a Hare swimming across an arm of the sea about a mile in breadth was given by the late Mr. Yarrell in the fifth volume of "Loudon's Magazine." On hearing an unusual sound the first impulse of a Hare is to sit upright with erected ears to reconnoitre; then it either endeavours to conceal itself by "clapping" close to the ground, or at once takes to flight. It is a cunning animal, and the sharp turns or "wrenches" by which it strives to baffle the fleetest but less agile greyhound constitutes one of the principal beauties of the sport of coursing. Owing to the length of its hind legs the Hare is much fleetest up

hill than down—in fact, in descending a steep bank, it is obliged to run diagonally to avoid over-balancing itself.

The Hare is as exclusively a vegetable feeder as perhaps any known mammal. The structure of the teeth has been already alluded to, and that of the whole of the digestive organs is not less adapted to such a diet. Its food consists of various kinds of herbage, and it becomes at times a very annoying and destructive invader, not only of the field and garden, but also of young plantations, gnawing off the bark and thus destroying great numbers of young trees. It also does great damage in fields of young wheat and other grain, and it is especially fond of aromatic herbs, such as thyme, parsley, &c. Mr. S. Mawson has recorded in the “*Zoologist*” for 1867, that the stomach of a Hare killed in winter contained a quantity of hawthorn-berries.

This animal pairs when a year old, or even sooner, and the female, after thirty days’ gestation, brings forth from two to five young ones, which are born covered with hair and with the eyes open. There are several broods in the year; in mild winters young Hares have been found in January, and we have known breeding to continue till the middle of November, so that the Hare may almost be said to propagate its species all the year round. The “leverets,” as the young are called, are suckled for about a month, after which they leave their mother and seek their own subsistence. The long-mooted question of the possibility of superfœtation has been supposed by some to be decided in the affirmative by circumstances which have for ages been known to take place in this animal. Pliny distinctly states that the Hare and the Rabbit are the only animals in which it does occur.* Sir Thomas Brown devoted a

* “*Lepus omnium præde nascens, solus præter dasypoden superfœtat, aliud educans, aliud in utero pilis vestitum, aliud implume, aliud inchoatum gerens pariter.*” —*Hist. Nat., lib. viii. cap. lv.*

chapter of his work on "Vulgar Errors" to the Hare, in which he refers to the same subject, and M. Frédéric Cuvier has also alluded to it. The solution of the difficulty will at once strike any one who is acquainted with the anatomy of this group of animals.

The Hare has been the subject of various superstitions. Of the medicinal qualities of its flesh frequent mention is made by Pliny; and various omens were derived from its appearance both in ancient and mediæval times. Izaak Walton observes that "there are many country people that believe that Hares change sexes every year, and there be very many learned men think so too, for in their dissecting them they find many reasons to incline them to that belief." In some parts of Sweden a Hare's head is always cut off as soon as it is shot, lest a pregnant woman should happen to see it, in which case her child would be born with a "hare-lip"; and in Scotland it is believed that the same effect will be produced if the mother should step over a Hare's form.

This appears to have been a well-known animal from remote antiquity. It was the *λαγως* of the Greeks and the *Lepus* of the Romans; and from the latter name are derived the Italian *Lepre* and *Lievora*, Spanish *Liebre* and *Lebratillo*, Portuguese *Lebrimho*, French *Lièvre* and our own *Leveret*. The English name *Hare*, Anglo-Saxon *Hara*, German *Hase*, Danish *Haas*, and Swedish *Hara*, are evidently all from one root, but their derivation has been disputed. Some have derived them from the Saxon *hær*, "hair," from the hairy coat of the animal, others from *hergian*, "to harry." More probably they may be traced to an Ayrian root, represented by the Sanscrit *çaç*, *çaça*, "to jump." The derivation of the Scotch name *maukin* is still more obscure.

The head of this animal is thick, the inside of the

cheeks hairy, the nostrils circular and connected by a fold with the cleft upper lip. The eyes are large and prominent, the pupil elliptical, and the ears elongated, being about an inch longer than the head. The limbs are slender; the fore legs are much shorter than the hinder, and have five toes, whereas the latter have but four; the soles of the feet are completely covered with long coarse hair. The tail is short and recurved. The general colour is a mixture of grey with yellowish and reddish brown, each hair on the back being ringed with grey, black and reddish-yellow, except some of the longer hairs, which are wholly black. The neck, shoulders and limbs are nearly pure yellowish-fawn, the lower breast and belly white. The ears are externally yellowish-grey in front, whitish behind, and terminate in a black tip; internally they are nearly naked. The tail is black above and white below.

Young Hares are more ruddy than adults. As already noticed, this animal in northern climates shows a decided tendency to become white in winter, and even in this country a considerable difference may be observed in its winter coat, especially in aged individuals and in severe seasons. Accidental varieties of an unusually pale colour are sometimes met with, and black Hares have been recorded, but are very rare.

The average weight of a Hare may be taken at seven to eight pounds, but occasionally they are much heavier. We have known one of eleven pounds, and an instance is recorded in "Loudon's Magazine" of a female which weighed no less than thirteen pounds one ounce and a half.

Dimensions:—

	Inch.	Lines.
Length of the head and body	21	8
„ of the head	3	10
„ of the ears	1	10
„ of the tail	3	8
	X X	



MOUNTAIN HARE.

Lepus variabilis (Pallas).

Specific Character.—Light fulvous-grey, becoming pure white in winter in severe climates; ears shorter than the head, permanently tipped with black; tail little more than half the length of the head. First upper grinder notched at its interior angle.

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|---------------------------|---|
| <i>Lepus variabilis</i> , | PALLAS, Nov. Spec. Glir. p. 1. |
| „ <i>borealis</i> , | NILSSON, Skand. Fauna, vol. III. t. 19. |
| „ <i>canescens</i> , | „ „ „ „ III. t. 22. |
| „ <i>hibernicus</i> , | YARRELL, Proc. Zool. Soc. 1833, p. 88. |

THE Mountain Hare is extensively distributed throughout the countries which lie round the Arctic Circle, and on such higher mountain ranges as present a suitable climate in more southern latitudes, where it appears to have been left with the other alpine animals at the close of the glacial epoch. It is spread all over the north of Europe and Asia, and is represented in North America by a closely allied species, the *L. glacialis* of Leach, which some naturalists regard as identical. On the plains it finds its southern boundary in Scotland and Ireland, in Russia

about 55° north latitude, and in Eastern Prussia. South of this it inhabits the whole chain of the Alps and their dependant ranges, the Pyrenees, and, according to Ménétries, the higher peaks of the Caucasus. In the Færoes Herr Müller states that two pairs were introduced into Stromö in 1854, and their descendants may already be counted by thousands. Like the common Hare, it has been divided into several species, which we believe must be regarded merely as climatic races. Of these Blasius has distinguished three forms; first, that inhabiting the warmer low-grounds, as in southern Sweden and Ireland, and not changing colour in winter; secondly, the ordinary type of the Alps and of North Europe generally, grey in summer and pure white in winter; and, lastly, the polar form, said to be found in the extreme north of Scandinavia and Russia, which is white all the year round. The first of these varieties is the *L. canescens* of Nilsson and the *L. hibernicus* of Yarrell, while the last is Nilsson's *L. borealis*.

In Britain the Mountain Hare is found throughout the greater part of Scotland and the whole of Ireland: in the former country it is usually known as the "Blue Hare." It is extremely plentiful in most parts of the Highlands north of the Forth, and of late years it has been introduced into some of the hilly districts of Peebleshire, Lanarkshire and Ayrshire, where it is worthy of remark that the annual change of colour is much less regular and complete than in the north. It appears to have been formerly a native of the Orkneys, as noticed by Sir Robert Sibbald and in a manuscript of the seventeenth century quoted by Messrs. Baikie and Heddle; but it is now quite extinct in these islands, although found in many of the Hebrides.

We have already stated that this species does not change

colour in Ireland. The Hare of that country was described by our late friend Mr. Yarrell in the "Proceedings of the Zoological Society" for 1833, under the name of *L. hibernicus*, and was treated of under that name in our first edition; our original illustration of the head of this form is repeated beneath. Its identity with *L. variabilis*, which was first pointed out by Blasius in 1841, is now fully established, and the comparative uniformity of its summer and winter tints must be attributed solely to the mildness of the Irish climate.



Intermediate in size between the Common Hare and the Rabbit, this species differs from them both in its habits. It makes no burrows like the latter, but hides in clefts of rocks or among large stones. It has not the swiftness of the Common Hare, nor does it associate in warrens like the Rabbit. Its ordinary food is similar to that of the other species, but it also feeds in winter on various kinds of lichens, and on the seeds of different sorts of pines. As that season approaches it usually leaves its high summer residence, and descends in search of a more

genial climate, though seldom so low as to be out of the reach of severe frost. In the north of Europe it is more a frequenter of woods than in Scotland. At the beginning of winter the fur undergoes a change of colour similar to that which we have described in the case of the Ermine; it becomes gradually more and more flecked and grizzled until at length it is wholly white, with the exception of the tips of the ears, which remain permanently black. We believe that this change takes place, as in all other mammals which become white in winter, by an alteration of colour in the existing fur itself, though some naturalists have stated the contrary to be the case. The white coat is retained during the whole winter; in spring it is cast, and is replaced by a grey summer coat. In Scotland the autumnal change has been said to begin about the middle of September and to be completed by the middle of November (*Edin. Phil. Mag.* v. II.), but it depends so entirely on the climate that no trustworthy dates can be assigned to it; in Switzerland Von Tschudi observes that it keeps pace with the same alteration of colour in the Ermine and the Ptarmigan.

The young of the Mountain Hare, like those of the last species, are born with a complete coat of fur and with open eyes, and they are very soon able to follow their mother. The period of gestation and the number of young in a litter is the same in both species, but the Mountain Hare is said to have only two broods in the year. F. Von Tschudi, in his excellent work "*Thierleben der Alpenwelt*," asserts that mules between *L. timidus* and *L. variabilis* are often met with in Switzerland, a statement which seems to require further confirmation.

The Mountain Hare is less in size than the common species; the head is smaller and more rounded, and the ears are considerably shorter in proportion, not equalling the

length of the head. The hind legs are much shorter, as is also the tail, which is usually pressed closely to the rump, so as to be scarcely visible. The fur is full, soft, and woolly. In summer it is of a grey colour, with more or less admixture of yellowish-brown silky hairs on the upper parts; the ears are grey, tipped with black; the tail, pale grey above, white below; the under parts light grey, becoming dirty white on the belly. In winter, in cold climates, the whole animal is pure white, except the tips of the ears, which remain jet-black.

Dimensions :—

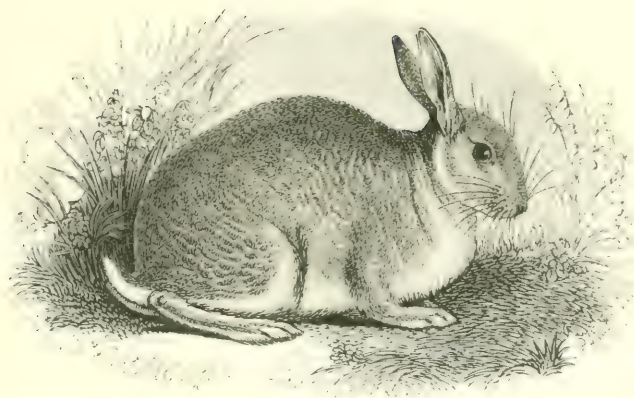
		Inch.	Lines.
Length of the head and body	. . . .	21	6
„ of the head	. . . .	4	6
„ of the ear	. . . .	3	3
„ of the tail	. . . .	2	6

The figure at the beginning of this article was drawn from a living specimen formerly in our possession, but the colour is that of one near the completion of the autumnal change.



RODENTIA.

LEPORIDÆ.



RABBIT.

Lepus cuniculus (Linn.).

Specific Character.—Colour brownish-grey mixed with tawny; belly, white; tail blackish above, white below; ears about as long as the head.

Cuniculus, PLINY, Hist. Nat. VIII.

Lepus cuniculus, LINNÆUS, Syst. Nat. I. 72.

THE Rabbit, so well known in England as one of the worst pests of the farmer, is believed to be only a naturalized inhabitant of Western and Central Europe, its native land being the cis-alpine countries of the Mediterranean basin. It is plentiful in Spain, in parts of Italy and Greece, and in the islands of Corsica, Sardinia, and Sicily, and it is said to inhabit the Barbary coast. North of the Alps it is very locally distributed, being unknown in a wild state in many parts of Western Europe and very abundant in others, while it is not found in the eastern and northern countries.

In our own country the Rabbit is abundant in almost

every district of Great Britain and Ireland, and in most of their dependant isles. In many places it has become extremely abundant, owing to its preservation for the purpose of sport and the destruction of its natural enemies—indeed we may say, without entering on argument, that it is to this animal that the preservation of game in Britain owes the most of its present unpopularity. In some parts of Scotland the species has increased enormously of late years, even where it has not been purposely encouraged, a result which may probably be attributed to the persecution by man of all beasts and birds of prey, and especially of the Weasel tribe.

The Rabbit differs from the Hare in its smaller size, its more plump and rounded body, and its much shorter ears, and hind legs, as well as in its more uniform grey colour. Its habits differ no less than its form. Unfitted by its organization for that long-continued and rapid course by which the Hare is distinguished, it seeks at once its safety and its shelter in deep holes of its own digging, and associates in large societies in places suitable for the easy excavations of its burrows. Sandy heaths covered with furze are a favourite resort of Rabbits, and in such places they often multiply to a great extent; the soil being easily penetrated, and the furze affording at once a secure cover to their retreat, and a wholesome and never-failing supply of food; the young tops of the plants are constantly eaten down and the bushes present the appearance of a solid mass, with the surface even and rounded as high as the rabbits can reach when standing on their hind legs. Where undisturbed they may be seen abroad at all hours, but generally they remain in their burrows during the day, coming out towards twilight to feed. On moors, where the soil is very wet, Rabbits often refrain from burrowing, and content themselves with runs and galleries formed in

the long and matted heather and herbage. In more than one instance we have known a family to take possession of a hollow tree and ascend its inclined and decayed trunk for some distance.

A Rabbit-warren presents towards evening a curious and not uninteresting spectacle. The ground everywhere pierced with deep and tortuous holes, the absence of all esculent vegetation around it, and the playful gambols and rapid retreat of the inhabitants, as they either sport in security or fly from the approach of danger, are circumstances which at once indicate the peculiar habits of the species and present a lively and amusing scene.

The Rabbit begins to breed at the age of six months, and has several litters in the year, during winter as well as in summer. From five to seven or eight young are brought forth at a time, and we have known an instance in which the number amounted to eleven. They are born blind and nearly naked, whereas we have seen that those of the Hare are covered with fur and have the eyes open at birth—an admirable provision for the comparatively unprotected situation in which the latter little creatures are brought forth. When the female Rabbit is about to give birth to her young, she forms a separate burrow, at the bottom of which she makes a warm nest of fur plucked from her own body; this breeding-burrow has seldom more than one entrance, whereas the ordinary residence has always a postern gate for escape. The mother covers over this single entrance with earth, and visits her offspring only under cover of the night. It is evident from the above facts that the multiplication of this species is extremely rapid; so much so that it would soon become an intolerable scourge to the agriculturist if its numbers were not kept down by its natural enemies. Now that our native beasts and birds of prey are so greatly reduced

in numbers, its most dreaded foe is man, who pursues it with guns, traps, nets, dogs, and ferrets.

The Rabbit is well known in a domesticated state. It then varies much in colour, being brown, fawn, reddish-brown, or black, more or less mixed with white, and it is very subject to albinism, which is perpetuated as a fixed race. The fur is sometimes much lengthened, as in the so-called "Angora" breed; while in what are known as "Fancy-Rabbits" the ears are enormously elongated and droop so much as to touch the ground. This last development is associated with a very curious change in the bones of the skull, of which an interesting account will be found in Mr. Darwin's work on the "Variation of Animals and Plants under Domestication." The flesh of the tame Rabbit is very inferior in flavour to that of the wild, but the former is more esteemed in London on account of its greater tenderness.

Besides the changes produced by domestication, this species presents us with a very curious instance of variation in a wild state, of which Mr. Darwin has given a full account in the work just alluded to. In the island of Porto Santo, near Madeira, there is a feral breed which is known to have descended from some tame Rabbits which were turned down in 1418 or 1419 by J. Gonzales Zarco. These Rabbits are now much smaller than their European relatives, being nearly one-third less in weight; the upper parts are much redder, and the lower surface is more grey, while the tail is reddish-brown above. Two which were brought to England would not breed or even associate with other Rabbits, and if their history had not been known they would certainly have been regarded as belonging to a perfectly distinct species.

Our English word Rabbit is allied to the Dutch *Robbe*, *Robbeken*; the origin of both is very doubtful, though

Skinner has derived the latter from the Latin *rapidus*. The old English name of Coney has its analogue in most European languages; as the Italian *Coniglio*, Spanish *Conejo*, Portuguese *Coelho*, German *Kaninchen*, Danish and Swedish *Kaning*, Belgic *Konin*, and Welsh *Cwningen*; these are evidently allied to the Latin *Cuniculus*, of which no very satisfactory derivation has been suggested. It is perhaps hardly necessary to add that the animal mentioned in the Bible to which the name Coney is applied in our version, is not the Rabbit, but the Syrian Hyrax (*Hyrax syriacus*).

The general form of this species is fuller and rounder than that of the Hare, and the flanks are less contracted; the head and ears are much shorter (especially the latter), as are also the hind legs. The general colour is a greyish-brown, the neck reddish-fawn, the throat and belly white, the ears are brownish-grey throughout their whole length, with a narrow black margin at the extreme tips, and the tail is blackish-grey above, white beneath. Pied, black, and fawn-coloured varieties not unfrequently occur in a wild state, even where there can have been no admixture of tame blood.

Dimensions:—

	Inch.	Lines.
Length of the head and body	16	6
„ of the head	3	6
„ of the ears	3	8
„ of the tail	3	2

RUMINANTIA.

CERVIDÆ.



GENUS CERVUS (Linnæus).

Generic Character.—Antlers rounded or palmated, with two or more basal tines directed forward. Canine teeth developed in some species. Muzzle bare and moist; tear-pits well developed; tail moderate.

RED DEER OR STAG.

Cervus elaphus (Linn.).

Specific Character.—Antlers rounded, with three tines directed forwards and a “crown.” Canines present. Tail short. Reddish-brown in summer, greyish-brown in winter: the rump pale.

Cervus elaphus, LINNÆUS, Syst. Nat. I. 93.

„ *nobilis*, KLEIN, Quadr. 23.

THE genus *Cervus* of Linnæus, constituting the family *Cervide* of modern authors, is as well marked and natural

a group as is to be found in the whole of the mammiferous class. The single character of the possession of branching bony antlers, without any horny covering, and shed annually, is at once so tangible and important as to leave no doubt of the relationship of any one species of the whole group. The only approach to a connecting link in this respect is found in the Prong-horn Antelope of America (*Antilocapra americana*, Ord), in which the horny sheaths of the horns are now known to be deciduous, but as the bony cores remain persistent it can only be considered as a very distant approach to the peculiar organization of the present family.

That the horns, or as they should rather be named the antlers, of Deer are intimately connected with sex, is proved by every circumstance of their growth and economy. With the exception of the Reindeer (*Rangifer tarandus*, Linn.) of the northern regions, the female possesses no antlers, the annual shedding takes place shortly after the pairing season, and horns are either absent or very rudimentarily developed in the castrated male. The antlers of the Deer rise from the frontal bone, and consist of the *burr* or rough protuberant ring at the base, the *beam* or main stem, and the *branches* or *antlers*, which have various names according to their position, as the *brow-antler*, *bez-antler*, and *royal*. The growth of such a mass of bony matter, amounting in some of the larger species to many pounds weight, is an astonishing instance of the rapidity of the production of bone under particular circumstances, the antlers of a full-grown Stag being produced in about ten weeks. The new weapon is at first soft and extremely vascular, it is covered with skin and clad with a soft hairy coat termed the *velvet*, and is provided throughout with blood-vessels, which transmit the necessary nourishment from the

external carotid arteries, which are temporarily much enlarged. When the antler has assumed the size and form characteristic of the species and of the age of the individual, the *burr* is developed, and by compressing the bases of the larger vessels it cuts off the supply of blood. The substance of the antler then assumes its proper density and hardness, and the *velvet* dries and peels off in shreds, a process which is hastened by the animal rubbing his horns against trees or rocks. The perfect antler thus produced is a most effectual weapon of defence in many species, and they are often used in the pairing season in the violent and sometimes fatal combats between the males. Soon after that season the Deer instinctively seeks seclusion, the union of the burr with the frontal bone becomes loosened, and the antlers fall off, to be again renewed in the same manner. Such is a brief and general description of this remarkable process, the details of which vary in the different species, as will be noticed hereafter.

The Red Deer or Stag is a native of the more temperate regions of Europe and Northern Asia, but in the former continent its limits have been much reduced by the advance of civilization and agriculture. In Scandinavia it is confined to a few forests in Sweden, principally in the province of Scania, and to some of the Norwegian islands, notably that of Hittern, near Bergen, where it is carefully preserved. In Russia it is said to be only found in the Caucasus, but it is a native of a considerable part of Siberia from the Ural to the Lena, and is stated by Middendorf to extend as far south as the Mandshuri Mountains. The Stag was formerly very generally distributed throughout Central Europe, and although it has been exterminated in many places, it still holds its ground in some parts of Britain, in the larger

forests of France and Germany, and more abundantly in the more Eastern States, as Hungary, Servia, Transylvania, Poland, the Danubian Principalities, &c. South of these countries it is found, though more rarely, in parts of Greece, Italy, and Spain, and it inhabits the islands of Corsica and Sardinia. Within these limits the Red Deer varies not a little in its size and in the comparative development of its antlers; thus the Eastern form is unusually large and carries a fine head, whereas the Stag of the Norwegian, Scotch, and Mediterranean islands is small in size and has only a stunted growth of antlers. It has accordingly been endeavoured to divide the European Red Deer into various species, but there appears to be no ground whatever for such a step. Its nearest allies or representatives in other countries appear to be the *Cervus wallichii* of the Himalayas, the *C. barbarus* of North Africa, and the *C. canadensis*, or Wapiti, of America.

In ancient times, when the British Islands were clad with almost uninterrupted forests, the Stag undoubtedly ranged throughout the whole country. But as civilization and population increased, it was driven to find shelter in the chases and preserved forests of the Kings and of the great feudal lords, many of which were purposely laid waste for its benefit, and where it was protected by forest laws of the most savage severity—it was better to have been a homicide in those days than to have killed one of the King's Deer. These retreats gradually diminished in number, one after another was disafforested, and others were sacked by the peasantry in times of civil war. In England Red Deer were abundant in Woolmer Forest in Hampshire as late as the reign of Queen Anne, as is mentioned by White of Selborne; a few lingered down to the present century in Epping

Forest, and we have ourselves seen some in the New Forest many years ago. But exclusive of those kept in regularly enclosed parks, the species must now be regarded as being confined in England to the moorlands of Devonshire and Somersetshire; in Ireland to certain districts in Erris, Connemara, and Killarney; and Scotland to the Highlands north of the Forth and Clyde, and to the adjacent islands. It is not now found in Shetland or Orkney, though it was anciently a native of the latter islands, but it is plentiful in both the Outer and Inner Hebrides, where the breed has been much improved of late years by the judicious introduction of fresh blood.

It is in the Highlands of Scotland only that the Red Deer is now found in large numbers in Britain, and great tracts of country have there been devoted to its exclusive use, a policy of which the national advantages have been the subject of not a little discussion of late years. The old Highland mode of hunting by surrounding a great extent of country by a huge circle or "Tinchal" has been long abandoned, the orthodox manner of killing a Stag now being by stalking it—a task of no little difficulty—till the sportsman comes within rifle-range. Deer are also sometimes driven through the mountain passes where the guns have been placed in ambush, or are run down with rough deerhounds, but the latter are more often used to secure a Stag which has already been wounded. Several excellent accounts of these sports have been written, of which the best will be found in St. John's "Wild Sports of the Highlands" and in Scrope's "Days of Deer-stalking," and many incidents of the chase have been immortalized in the pictures of Sir Edwin Landseer. In Ireland and in Devonshire wild Red Deer are still pursued with Hound and Horse and horn in orthodox fashion, but those which afford sport to Her

Majesty's Buckhounds and other packs are tame Deer whose antlers have been sawn off, and which are brought to the meet in a cart, in which they return in ignoble safety to their paddock after the chase is concluded.

The Red Deer, like most of the family, is a gregarious animal. Except in the rutting season, the sexes remain separate, the Hinds, Calves, and young males consorting together, and usually preferring lower ground than that frequented by the full-grown Stags. In its choice of ground this species varies much in different countries. On the Continent it is almost exclusively known as an inhabitant of the largest forests, where it hides itself by day in the densest thickets, and comes out to feed by night in the open glades and meadows, or invades the nearest cultivated grounds. In Scotland, on the other hand, it ranges over the barren and exposed hills, sheltering itself in the glens and corries, and living as thoroughly a mountain life as the Reindeer of the Norwegian fjelds.

The pairing season begins in the end of September, or beginning of October, and lasts about three weeks. The full-grown Stags then wander about in search of the Hinds, and make the rocks and mountains resound with their "belling" or roaring on moonlight nights, and in the early morning. When two Stags of similar size and strength fix their affections on the same female a desperate fight ensues, which not unfrequently proves fatal to one or even to both—for not a few cases have been recorded in which the combatants have interlocked their antlers so firmly as to be unable to separate, and so have perished miserably. During these duels the Hinds never interfere, but look on or graze in serenity till the rival suitors have settled their pretensions. The female goes with young eight months and a few days, and has usually

only one calf. She retires from the herd to bring forth, and continues to attend to her young with the greatest assiduity and tenderness; in winter the females and calves again reassemble in a herd. About February, the old Stags drop their antlers, the young ones retaining theirs somewhat longer, and soon after they begin to be replaced in the manner above described. At this time they seek the most solitary places, and remain quite apart from the rest of the herd.

A very ancient popular belief, traced by Sir Thomas Browne back to the ancient Egyptians, attributes an extraordinary longevity to the Stag. This is fully believed by the Highlanders of Scotland, and several curious and circumstantial traditions of Stags living for a hundred years and upwards will be found in Mr. Scrope's interesting work. In parks, however, Red Deer are found to have reached their full prime at twelve, and seldom to live for twenty years, and it does not appear probable that this limit is very much exceeded in a wild state.

The derivation of the English names applied to the Deer tribe is interesting, showing how completely the simple Saxon words of the stout yeomen and outlaws ousted the Norman-French terms used by Princes and Barons. Thus Deer is the Anglo-Saxon *Deor*, its primary meaning signifying simply a beast (German *Thier*, Greek *Ther*, Latin *Ferus*). Stag originally meant a male animal of any species, as in the Icelandic *Steggr*, a male, and the Scotch *Staig*, a young horse. *Heort* and *Hind* are also Saxon. *Venison*, however, is from the French *venaison* (perhaps allied to the Latin *venor*, to hunt), and *antler* is from the old French *antoilier*, but *beam* and *tine* are from the Saxon words *beam*, a tree, and *tind*, a tooth or spike. Many of the quaint old terms of wood-craft have

now become obsolete, and most modern deer-stalkers would be puzzled to distinguish a *Spayard* from a *Staggard*, or a *Knobber* from a *Brocket*. Guillin, in his "Display of Heraldrie," thus explains some of these terms :—"Whereas some men are of opinion that a *Stagge*, of what age so ever he be, shall not be called a *Hart* until the *King* or *Queene* have hunted him ; that is not so : for after the fift yeare of his age, you shall no more call him a *Stagge*, but a *Hart*. So then at sixe yeares old he is called a *Hart*. Now if the *King* or *Queene* doe chase or hunt him, and hee escape away alive, then after such hunting or chasing he is called a *Hart Royall*." In Scotland the term *Royal* is generally applied to a Stag which carries twelve regular points.

A fine Stag stands four feet, or even more, at the shoulders. The head is beautifully formed, and is carried aloft with a very proud and noble carriage. The tear-pits or lachrymal furrows are moderately developed, the muzzle naked, and the ears about half the length of the head. The antlers are long, finely curved, and rough, their section being an irregular oval with a tendency to approach to a sub-triangular form ; their normal development in the adult may be considered as including three tines directed forwards, which are sometimes named the *brow*, *bez*, and *royal antlers*, and the *cup*, *crown*, or *surroyal* of three or more branches at the end. But these divisions are subject to considerable variation, to which we shall allude presently. The neck is somewhat long and thick, and is heavily bearded on the throat with long coarse hair, especially in the rutting season. The body is compact, the legs long and muscular, and the tail short, being about one-half as long as the ear. In summer the general colour is bright reddish-brown ; the head and legs being somewhat greyer, the throat pale grey, and the

buttock marked by a large yellowish-white patch. In winter, the coat is longer and softer, and the colour is more of a brownish-grey. White varieties are not uncommon in parks, and are occasionally met with in a state of nature. The Calves are beautifully spotted with white during their first summer.

The number of tines of a Stag's antlers varies very much, and it is scarcely necessary to observe that the popular idea, that one is added for every year of the animal's life, is quite without foundation. It is true that this is the case during youth, but when a Stag has reached its maximum of strength and vitality the size of its weapons increases no longer, or even decreases as the creature becomes old and decrepid. We have already observed that in a normal antler the three anterior branches are always present, the variation in number lying in the crown or cup, the branches of which may be more or less numerous, and still remain quite regular. But some of the most famous heads can only be considered as abnormal.

There can be no doubt that the size and development of the antlers depend very much on the food which the animal consumes, and that as the Red Deer has been gradually driven back from the best pastures by civilization, it has degenerated in consequence. The antlers found in the alluvial deposits of this country present a calibre and development which has been even considered to point out a specific distinction, and both here and abroad the heads of Stags killed two or three centuries ago are much larger and finer than those of the present day. In Scotland, where breeding in-and-in has probably also had its effect, fine heads are now rare. In Eastern Europe the average is considerably better, but nowhere could antlers now be found which could compare with some of the old heads

preserved in various collections, especially in Germany. In Lord Powerscourt's collection is a very fine pair of antlers, believed to have belonged to a Stag killed in Transylvania about two hundred years ago, which weigh seventy-four pounds, and have forty-five points. This, however, is surpassed by some in the German Castles, one especially at the Moritzburg, in Saxony, boasts sixty-six tines. These collections are also rich in "abnormitäten," or deformed antlers, often of most strange and fantastic growth, whose variations are to be attributed to various causes, but especially to breeding in-and-in, and injuries to the organs of the Deer during the production of the antlers. Such deformed heads, called in Gaelic "chromeh," are particularly common in some of the Scotch Islands, especially in Mull.

The average weight of good Stags in Scotland may be taken as ranging from fifteen to twenty imperial stone, but much heavier animals are sometimes killed. Mr. Scrope mentions several which have exceeded thirty stone, and considered that the Sutherlandshire Deer offer the highest average weight. An outlying Stag killed at Woburn, in 1836, weighed thirty-four stone live weight.



RUMINANTIA.

CERVIDÆ.



FALLOW DEER.

Cervus dama (Linn.).

Specific Character.—Antlers with the beam rounded at the base, palmate towards the extremity; two basal tines directed forwards. No canine teeth. Tail longer than the ear. Yellowish-brown with whitish spots, sometimes uniform dark brown.

Cervus dama, LINNÆUS, Syst. Nat. I. 93.

„ *platyceros*, RAY, Syn. Quad. 85.

Dama vulgaris, GESNER, Quadr. 335.

THE Fallow Deer, so well known as a half-domesticated denizen of parks, chases, and preserved forests, appears to have been originally an inhabitant of the countries lying around the Mediterranean Sea. Prince Buonaparte states it is still plentiful in the island of Sardinia, and it is also

a native of Spain, of some of the Grecian Islands, and of parts of North Africa. From these regions it has been introduced into Central Europe, and with some artificial protection it supports the cold of winter as far north as the southern provinces of Scandinavia. The date of its introduction into this country is quite uncertain, but it is mentioned by Fitz-Stephen and other ancient chroniclers, and it seems not improbable that it was first brought over by the Roman colonists. The dark-coloured variety is said to have been introduced from Norway by James I., on account of its superior hardiness of constitution.

Fallow Deer are gregarious to a great extent, associating in large herds, the Bucks apart from the Does, except in the pairing season and early winter, when the sexes consort in company. Most persons must be familiar with their boldness and the confident manner in which they will approach mankind, where they are well accustomed to his presence; importuning the stranger who pic-nics in Greenwich Park for a biscuit or an apple, which is seldom refused. The fondness of the Deer tribe for musical sounds is well illustrated in the following extract from Playford's "Introduction to Music":—"Travelling some years since, I met on the road near Royston a herd of about twenty [Bucks] following a bagpipe and violin, which, while the music played, went forward; when it ceased, they all stood still: and in this manner they were brought out of Yorkshire to Hampton Court." A love of music is not confined to this family; there is more than poetic truth in the story of the power of Orpheus's lyre over the beasts of the field, and Shakespeare avails himself of this predilection in cattle to form one of his exquisite illustrations.

Like the other species, the Fallow Deer feeds on herbage; it has been noted that it is especially fond of horse-

chestnuts, which the Bucks knock down from the branches with their antlers, and the tree is consequently frequently planted in Deer-parks.

The pairing season begins in September and the Doe goes eight months with young ; she brings forth generally one Fawn, not unfrequently two, and sometimes three, at a birth, and conceals them as does the Hind, but somewhat less carefully. The young male exhibits the first signs of his antlers in his second year, when they make their appearance as simple snags, and the animal is called a *Pricket*. In the third year the two anterior tines are produced, and the extremity of the beam becomes flattened or palmate. The fourth finds them further developed in size, and the palmate portion is deeply indented or incised. In the fifth year, when he attains to the title of a *Buck of the first head*, the antlers have acquired nearly their full development, but in the sixth the snags of the flattened part of the beam, called *spillers* or *advancers*, become more numerous, and the palmation has attained a great breadth. The processes of shedding and reproduction of the antlers is precisely similar to those described in the Stag, but not only is their form quite different, but the excrescences and furrows are much less distinctly marked ; they are shed in spring, somewhat later than in the last species.

Fallow Deer venison is usually considered superior to that of the Red Deer, being generally much fatter, but the latter is considered by some to have the finest flavour. The skin of both the Buck and Doe is well known as affording a soft and durable leather. The antlers, like those of other species, are manufactured into the handles of knives and other cutler's instruments, and the shavings and refuse have always been employed in the manufacture of ammonia, whence the common name of *hartshorn*.

The word *fallow* describes the prevailing colour of the animal, being the Anglo-Saxon *fealo*, allied to the German *falb*, the Slavonic *plav*, yellow, the Latin *palidus*, pale, and the Sanscrit *palita*, grey. Thus in the early English writers "to falow" means to grow pale, to fade. "Buck" is probably from the Teutonic *bocken*, to strike, and is therefore an animal which strikes or butts with its head; hence it has become the general name of the male of the beasts of chase, even including those which have no horns, as the Hare and Rabbit. "Doe" is the Anglo-Saxon *da*, probably from the same root as the Latin *dama*, a deer, and the Sanscrit *dam*, to tame; thus the Doe would mean the tame or harmless animal. "Fawn" is from the French *faon*, *feon*, which, say some, is derived from the Latin *infans*, or, more probably, through the old form *fedon*, from *fœtus*, an offspring.

The Buck usually stands about three feet, or rather less, at the shoulder, and measures about five feet in total length, of which the tail occupies nearly seven and a half inches. The head is small, the tear-pits well developed, the muzzle tapered, and the eye large and lustrous. The ears are long and pointed, exceeding half the length of the head. The antlers have only two anterior tines, the presence of a third being a very rare abnormality, but the hinder margin of the flattened portion of the beam is notched out, so as to form an indefinite number of points. The tail is longer than the ear.

In colour the Fallow Deer of our parks vary much. The normal tint is a fawn or yellowish red-brown, spotted with white, and becoming more grey in winter. The dark brown variety has already been mentioned, and Deer may be seen of every shade from pure white to almost coal black.



Genus CAPREOLUS (H. Smith).

Generic Character.—Antlers small, upright, rounded, with no basal tine. Tear-pits only slightly developed. No canines.* No external tail.

ROE DEER.

Capreolus caprea (Gray).

Specific Character.—Antlers with two tines, one directed forwards, the other backwards. Colour reddish-brown in summer, yellowish-grey in winter; a large white patch on the rump.

Cervus capreolus, LINNÆUS, Syst. Nat. I. 94.

„ *pygargus*, PALLAS, It. I. 97.

Capreolus caprea, J. E. GRAY, Mamm. Brit. Mus. 176.

THIS Deer differs from the species already described in several important particulars, which, coupled with the

* Abnormal skulls with canine teeth have, however, been described by Prof. Kölliker (Würzb. nat. Zeitschrift, vol. vi. p. 82).

remarkable peculiarity in its reproduction, appear to us to entitle it to generic distinction.

The Roe is a native of Europe and Northern Asia south of 58° north latitude. The Siberian form, however, has been separated as a distinct species, under the name of *C. pygargus* (Pallas), principally on account of its larger size, lighter colour, and longer antlers. But these hardly seem sufficient characters to afford grounds for specific distinction in so variable a family as the Deer tribe, and we are therefore inclined to follow Prof. Blasius in regarding the Roe Deer of Europe and Asia as belonging to one species—the only one of the genus yet known. In Europe it reaches its northern limit in the south of Sweden, and it extends as far south as Italy and Spain; it is not found in northern and central Russia, but occurs in the more southern provinces, in the Ukraine and the Caucasus. In Asia the larger variety is common in Persia and Tartary, and throughout Siberia from the Ural Mountains to the River Lena.

In Britain the Roe Deer was certainly very widely distributed in olden times, when the greater part of the country was covered with forests, but it gradually gave way before the advances of cultivation, and when Pennant wrote he regarded it as being restricted to the Scottish Highlands north of Perthshire. Owing to the stricter preservation of game and to the great increase of plantations, it has again enlarged its bounds, and it is now found in many of the more wooded districts of the south of Scotland and north of England, in some of which it is so numerous as to cause considerable damage to young plantations.

The favourite resorts of Roe Deer are large woods with a thick undergrowth, bordering on meadows or cultivated lands, to which they issue towards evening in

search of food. Usually they consort in small family parties, and they have regular paths and passes through the woods, returning to the same feeding-grounds day by day at the same hour. The paces of the Roe are a gentle trot and a high bounding gallop; its speed is not great, but it is a wonderful leaper—we have repeatedly seen one clear a fence much higher than itself apparently with the greatest ease. It is also an excellent swimmer, taking to the water even when unpursued, and in Scotland it is often known to cross lochs of more than half a mile in breadth. Its voice is a harsh bleat, though some have rather compared it to the yelp of a small dog.

Its usual food consists of grass, herbage, and the young shoots of bushes and trees. Ivy leaves are a special favourite, and on more than one occasion we have found its stomach filled with fungi of various species.

The breeding of the Roe Deer presents us with the most interesting points in its history, and was long a puzzle to sportsmen and naturalists, especially in Germany, where the species is abundant. Most writers have stated that the Roe is strictly monogamous, that it pairs in November or December, and that the Doe goes five months with young. This account seems confirmed by the fact that the *fœtus* was never found before January, and then only in a very undeveloped condition; but on the other hand it was well known that the sexes seek each other's company in July and August, and the investigations of the late Dr. Ziegler, published in 1843, proved conclusively that this was the true pairing season. The mystery was not cleared up till 1854, when Prof. Bischoff of Giessen, the well-known embryologist, published an elaborate treatise, entitled "*Entwicklungsgeschichte des Rehes*," in which he gave the results of ten years' careful investigation. We must refer our readers to the original

work for the technical details, which would here be out of place, but the results at which he arrived are briefly as follows. The pairing season is, as already stated, in July and August; but the germ or *orum* remains dormant and of very minute size for four months and a half (until December), after which it suddenly begins to develop at the usual rate, the whole period of gestation being forty weeks. As far as we are aware no similar phenomena have been observed in any other quadruped, and it is difficult to conceive why this species should differ so markedly from others which are nearly allied to it both in organization and habits. Either one or two Fawns are produced at a birth, usually early in May. These are at first carefully concealed by the Doe, which sometimes shows great boldness in their defence—we have known a small terrier which attacked a Fawn to be pursued for a considerable distance by the irate mother.

The Fawns, which like those of the other species are beautifully marked with white spots, follow their parent till winter. The young Buck then puts up his first antlers in the form of simple snags; the second pair have a single tine directed forwards, and the third winter a second branch directed backwards is added. The normal development of the antlers is then complete, although



they continue to increase in size and weight for some time longer. The adult Bucks drop their antlers about Christmas, and the new ones are usually fully developed

by the end of February. The engraving shows the annual change of the antlers from the second to about the sixth year.

Both in Scotland and Germany Roe Deer are generally killed by driving the woods with beaters, the sportsmen having previously been posted so as to command their favourite passes. The venison is considered to be inferior to that of both the Red and Fallow Deer; it is in best condition in winter, whereas the Stag is only in season during the summer months.

Roe is derived from the Anglo-Saxon *Rah*, *Raeh*, which is preserved in the Scottish *Rae*. The derivation of the words Buck, Doe, and Fawn have already been considered.

A fine Roe Buck will stand twenty-six inches or rather more, at the shoulder, and often weighs upwards of sixty pounds. The head is short and abruptly tapered, the eye rather large, the tear-pit very slightly developed, and the ear about two-thirds as long as the head. The antlers are short, upright, very rough and longitudinally furrowed; the first tine is distant about two-thirds from the base and is directed forwards, the second, higher up, has the contrary direction; very rarely each of the terminal points is again subdivided. The neck is slender, the body short, plump, and compact, the limbs long and slender. The colour is reddish-brown in summer, which is exchanged in autumn for a much thicker and finer winter coat of yellowish-grey; the lips are marked with black and white, and the rump with a large patch of pure white; the belly and the inside of the limbs are pale yellowish-fawn. Albinos are sometimes met with both in Scotland and in Germany.

The Roe is even more liable to malformations of the antlers than the Red Deer. In normal horns the length

is seldom more than ten or eleven inches, but in the *Field* of 2nd March, 1872, Mr. R. Winsloe mentions a pair from Austria in his collection which measured $15\frac{1}{8}$ inches in length and $14\frac{1}{2}$ from tip to tip. In the same newspaper, in 1866, a correspondent stated that a Doe bearing horns was shot that year near Kippenheim in the Black Forest.





GENUS *Bos* (Linnæus).

Generic Character.—Horns hollow, persistent, growing on a bony core, conical and curved. Body thick and heavy. Tail long, terminated by a tuft of long hair. Teats four.

WILD WHITE CATTLE.

Bos taurus (Linn.). Var. *Scoticus*.

Character of Variety.—Colour white, the ears tipped either with red or black; forehead flat, occipital ridge straight; horns moderate, lyrate, white with black tips.

Bos taurus, LINNÆUS, Syst. Nat. I. 98.

Urus scoticus, HAM. SMITH, in Griffith's An. Kingd. IV. 411.

Bos scoticus, SWAINSON, Quad. 285.

THAT the White Cattle, preserved in a half-wild state in a few parks in Scotland and England, are identical in species with our domestic Oxen is now universally

admitted, but their claim to be regarded as unsubdued descendants of the once mighty *Urus* is still a matter of dispute. Space fails us here to enter fully into the question, and we must confine our remarks to a short abstract of the arguments which have been put forward.

According to Prof. Nilsson, Prof. Rüttimeyer, and others of our best authorities on this family, the domestic Oxen of Europe are derived from *three* or *four* distinct races, known to geologists under the names of *Bos primigenius*, *B. longifrons*, *B. frontosus*, and *B. trochoceros*. From the first of these, which was undoubtedly the *Urus* of Cæsar and other ancient writers, the large long-horned Cattle of Northern Europe and of the Mediterranean countries appear to have descended, and of these the British Wild Cattle approach most closely to the original type, especially in their flat forehead, level occipital ridge, and the peculiar curves of their lyrate horns. But it is more doubtful whether they have always remained in a wild state, or are the representatives of domestic Cattle run wild, which have reverted in some degree to the characters of their progenitors. Several facts appear to be in favour of the latter supposition. Wild Cattle are certainly mentioned by various ancient writers as inhabiting the forests of Britain, as in the forest-code of King Canute (1017-36), and by Fitz-Stephen (*circa* 1174). They are also spoken of by Boëthius (1526), Leslie (1575), and other Scottish writers, but only as having previously existed in a free state, and as being already confined to a few parks and chases. But it seems at least possible that these mediæval "*Tauri sylvestres*" may have been descended from escaped Cattle, like the wild herds of South America and Australia, and surely more frequent mention would have been made of them had they resembled the large *Urus* of antiquity. The colour of the Wild Cattle

of our parks, and their tendency to vary in that respect, along with their small size as compared with the Urus, are all points in favour of the belief that they are the representatives of a breed of Cattle escaped from captivity, which in the course of generations of a wild forest life reverted to a considerable extent to the characters of their distant ancestors.

This breed of White Cattle has been recorded as having been kept at the following parks:—Kincardine (Kincardineshire), Stirling (Stirlingshire), Cumbernauld (Dumbartonshire), Cadzow (Lanarkshire), Drumlanrig (Dumfriesshire), Chillingham (Northumberland), Bishop Auckland (Durham), Burton Constable and Gisburn (Yorkshire), Lyme (Cheshire), Chartley (Staffordshire), and Wollerton (Nottingham). They now exist only at Cadzow, Chillingham, Lyme Park, and Chartley.

Of these the Chillingham herd appears to be the purest bred. The best account of it which we have met with is given in the second volume of the "Annals of Natural History," by Mr. J. Hindmarsh, who derived much of his information from the Earl of Tankerville himself. Nothing can now be learned of the ancient history of the cattle, but the park is known to have existed early in the thirteenth century. The Chillingham Cattle "have pre-eminently all the characteristics of wild animals, with some peculiarities which are sometimes very curious and amusing. They hide their young, feed in the night, basking or sleeping during the day; they are fierce when pressed, but generally speaking very timorous, moving off on the appearance of any one, even at a great distance." The Bulls fight fiercely for the command of the herd, and when one becomes old or feeble it is gored to death by the rest of the herd. The number of these Cattle in 1838 amounted to about eighty head; they have the muzzle

brown, and the inside and tips of the ears red. As in all the other parks, the uniformity of colour is only preserved by weeding out the badly-marked Calves which make their appearance from time to time.

The Cattle at Cadzow, the ancient seat of the Dukes of Hamilton, resemble the Chillingham breed both in appearance and habits, but are less timid, owing perhaps to being confined to a smaller range. Lord Tankerville in the paper quoted above stated that the Hamilton Cattle "have no beauty, no marks of high breeding, no wild habits," but this is certainly an error, for their manners almost exactly agree with what is recorded of the Northumberland herd. Like them they hide their Calves in thickets, and if any one approaches the place the whole herd rushes to the rescue. The Bulls seldom attain any great age, owing to their fierce and frequent battles for the mastership of the herd, for whenever one of them is wounded it is at once destroyed by the rest of the Cattle, who hasten to take the side of the victor. When any of them are shot the remainder become very timid, and it is difficult to get near them for some time afterwards; if one is wounded by a ball, it is at once driven from the herd and must be very cautiously dealt with, as it will charge with the greatest fury at any one who approaches. Their number is estimated at between sixty and seventy. They have the muzzle and ears of a deep black, and there are usually some flecks of the same colour about the head and fore-quarters.

The Cattle at Lyme Park, the property of the Legh family, have red ears; Lord Tankerville states that they "differ in every respect" from those at Chillingham, and Prof. Rütimeyer observes that a skull sent to him showed distinct marks of crossing or culture.

The breed at Chartley, the seat of Lord Ferrars, have

black ears. They are said to have become much tamer since the introduction among them of some tame white heifers, but were formerly very wild and even dangerous. A skull in the Museum of the Royal College of Surgeons presents the general character of the *primigenius* race, but the long, low, spreading horns differ widely from the lyrate form of those of the Chillingham and Cadzow Cattle. A very ancient tradition regards the birth of a parti-coloured or black Calf in this herd as an omen of the approaching death of some member of the proprietor's family, and several curious coincidences have fully confirmed the country people in the belief.

The Wild Cattle of our parks, when pure bred, are characterized especially by the form of their horns, which may be described as curving first backward and upward and then sweeping forward and downward, while the points turn upward. In the skull the forehead is flat, or slightly concave, and the occipital ridge between the horns is straight and level. In form these Cattle are beautifully shaped, with small heads, straight backs, and short legs. Their colour is white except the ears and muzzle, which are either red or black, according to the breed. The horns are white with black tips.



ORDER CETACEA.

Whales—Dolphins.

THERE is not, in the whole range of natural science, a study more variously and deeply interesting than the investigation of the laws by which those variations of structure are governed which have for their object the adaptation of the same organs to different functions in animals of various forms and habits.

The outward appearance of the Cetaceans, organized as they are for a permanent residence in the ocean, resembles so nearly that of the Fishes that they have been arranged together by the ancients and by the ignorant. Ray himself was not prepared to separate them, and even the example of the great Linnæus, who with his wonted correctness and judgment placed the Whales in their true position, was not sufficient to counterbalance the prejudices of Pennant, who regarded the Cetacea as forming a division of the class of Fishes, although he was well aware that they bring forth their young alive, and nourish them by means of mammary organs, similarly constructed to those of the whole class of Mammalia. Their true position, however, being established, it becomes a matter of great interest to ascertain what relation the other organs of the body bear to the corresponding ones in the other groups of this class, and by what modifications of structure they are rendered subservient to a mode of life so different from that of the more typical forms. A brief notice of the principal points of their organization, so far as they

bear on these apparent anomalies, will show that the important variation in form and habits are provided for by the modification of the structures which are essentially the type of the class, rather than by their abolition, and the production of new organs. We will first mention the peculiarities common to the whole order, and then those characteristic of the divisions into which it may be divided.

The skull of the Cetacea is remarkable for the great development of the jaws, which are extended far in front of the nasal passages, which, consequently, are directed upwards towards the top of the skull, instead of directly forwards as in most mammals. The proportions and relations of the various bones of which the cranium is built up are also much modified, and in most members of the order the whole skull is *asymmetrical* or distorted, to an extent unknown in any other vertebrate animals. The vertebral column is so formed as to be rigid in front, and flexible behind, for as the Whale has no distinct neck or external division of the head from the trunk, it is obvious that mobility is not here needful; whereas great flexibility is required further back, to allow of the action of the caudal-fin or tail in swimming and diving. Accordingly we find that the seven cervical vertebræ are very short, and are frequently more or less united by ankylosis, while the succeeding ones are separated by thick cushions of fibro-cartilage, none of them being united to form a sacrum, and the more posterior being but loosely articulated with one another. The ribs are, in some groups, very slightly connected with the vertebræ, and the breast-bone or sternum consists either of a single bone, or of several segments. The "flipper" of the Cetacean, although exhibiting externally no divisions or fingers, is supported by the very same arrangement of bones as

the hand and arm of man, as is well shown in the wood-cut here given of the anterior limb of the Porpoise.



The bones of the arm are much shortened, those of the wrist or carpus are closely united, and the fingers, which are four or five in number, are remarkable for the number of their joints, which sometimes, as in the second digit of the Pilot-Whale, amounts to fourteen, whereas no known mammal of any other order has ever more than three. The hind limb may be said to be entirely wanting, the pelvis being only represented by two slender bones floating in the flesh and unconnected with the vertebral column, while it is only in one group, the Balænoïd Whales, that even a rudiment has been found of the bones of the limb itself; in these some small bones and cartilages have been detected by Prof. Reinhardt, and subsequently by Prof. Flower, which are believed to be the representatives of the *femur* and *tibia*.

In respect to their dentition the members of this order varies greatly, as will be presently noticed, but there are never "milk-teeth" succeeded by a permanent set. The breathing apparatus is very peculiar, and is difficult to explain without the use of the technical language of anatomy. The nostrils or "blow-holes" are placed on the

top of the head, so that the animal can respire when only that portion is above water. It is evident, however, that it could not breathe thus when its mouth was full of water unless a peculiar arrangement was provided for the purpose. This is effected by the upper extremity of the wind-pipe being prolonged into a sort of cone or funnel, which reaches up into the posterior part of the nares, where it is firmly clasped by the surrounding soft parts. Thus there is a completely closed passage from the blow-hole to the lungs, and even when the animal is dashing open-mouthed through the water in pursuit of its prey, it can breathe whenever the top of its head is above the surface.

The outer skin of the Cetaceans is smooth and shining, and is totally devoid of hair, only a few bristles being sometimes present about the lips. On the back a compressed adipose "dorsal-fin" is very often developed, while the extremity of the tail is expanded into an extremely broad and powerful "caudal-fin," which is invariably horizontal, and not vertical as in Fishes. It is the principal organ of locomotion, and in the larger species is of enormous extent, so as to command sufficient power to drive their huge bulk through the water at a great velocity.

Under the skin lies a thick coating of fat or "blubber" of a peculiarly dense and elastic texture, and adhering closely to the integument, of which, indeed, it was formerly believed to be a modification. This blubber, which yields the oil for which the larger Whales are so relentlessly pursued by man, is not less useful to the animal itself, serving not only to preserve the heat of the body, but also to reduce the weight of its mighty bulk and to bring it nearer to the specific gravity of the water in which it exists.

One of the most famous phenomena in the life of the Whales is what is known as their “blowing” or “spouting,” about which many contradictory statements have been made. It has constantly been said that when a Cetacean comes to the surface to breathe, it throws up from its blow-holes a great jet of water, which in the larger species reaches to an extraordinary height. The theory by which this was explained was that the water was taken into the mouth, and then, the gullet being closed, was forced by the movements of the tongue and jaws through the nasal passages, and thence through the valvular opening of the blow-holes. But the results of more recent and careful observations—amongst which we may notice those of Bennett, Von Baer, Sars, and Burmeister—are directly opposed to the statement that water is thus ejected, and there can now be no doubt that the appearance which has given rise to the idea is caused by the moisture with which the expelled breath is supercharged, which condenses at once in the cold outer air and forms a cloud or column of white vapour. It is possible, indeed, that if the animal begins to “blow” *before* its head is actually at the surface, the force of the rushing air may drive up some little spray along with it, but this is quite different from the notion that water is really expelled through the nasal passages. We may add that on the only occasion when we have ourselves witnessed the “spouting” of a large Whale we were much struck with its resemblance to the column of white spray which is dashed up by a “ricochetting” ball fired from one of the great guns of a man-of-war.

There does not appear to be any remarkable peculiarity in the reproduction and lactation of the Cetaceans. The placenta is diffuse, and the teats, which are two in number, are inguinal in position. It has been supposed that the

milk is expressed into the mouth of the animal by a muscular action of the mammary organs, but there does not seem to be any evidence in support of the theory. The mother shows the greatest affection for her offspring, as will be shown in several instances in our account of the species, and constantly refuses to leave it if it falls a victim to the harpoon of the whaler.

The order Cetacea naturally divides itself into two very distinct groups, which are regarded by our friend Prof. Flower as deserving the rank of sub-orders, under the names of *Mystacoceti*, bearded or "Whale-bone" Whales, and *Odontoceti*, or toothed Whales. These differ in many very important points of structure, of which we can only point out a few of the more obvious, referring our readers for more minute particulars to that gentleman's memoir "On *Inia* and *Pontoporia*," in the Zoological Society's "Transactions" for 1867.

The most striking peculiarity of the *Mystacoceti* is the absence of teeth, which are replaced by great plates of a horny fibrous nature, which depend from the palate, and constitute the *baleen*—the "Whale-bone" of commerce. During foetal life true teeth do exist, as was long ago shown by Eschricht, but they are never developed, and soon become absorbed. The baleen plates are smooth on the external edge, but are frayed out, as it were, on the inner side into a loose fringe. They spring from transverse ridges on the side of the palate, and blood-vessels pass into the cavities of their substance. The whole structure of the skull is wonderfully modified in connection with this peculiarity. It is of enormous size, and is not laterally distorted, but the narrow rostrum formed of the elongated maxillary and premaxillary bones is greatly arched, while the branches of the lower jaw are much bent outwards, and are only united in front by

fibrous tissue. The result of this arrangement, which will be better understood by a reference to the figure of the skull of the Greenland Right-Whale at p. 386, is that the cavity of the mouth is of extraordinary capacity, and in the live animal it is entirely filled by the great ranges of baleen-plates, which are covered when the mouth is closed by the wide and deep lower lip. These Whales feed principally on minute Mollusks and Crustaceans as well as on smaller Fishes, and this structure of the mouth is admirably adapted for their capture. "Opening its huge mouth," says Prof. Huxley, "and allowing the sea-water with its multitudinous tenants to fill the oral cavity, the Whale shuts the lower jaw upon the baleen-plates, and straining out the water through them, swallows the prey stranded upon its vast tongue."

The Balænoïd Whales are further distinguished by the presence of olfactory organs, though in a comparatively undeveloped condition, by the double orifice of the blow-hole, by the very slight manner in which the ribs are articulated to the vertebræ, and by the form of the breast-bone or sternum, which consists of only a single piece, and is attached to the first pair of ribs only. The vertebræ of the neck may either be united into a solid mass, as in the Right-Whales, or may be all free, as is usually the case in the Rorquals. Two well-marked families, *Balenidæ* and *Balænopteridæ*, are represented in our fauna.

In the second sub-order, the *Odontoceti*, baleen is never found, and there are originally always true teeth, though they are sometimes lost early in life; often they are very numerous, and they are always single-rooted and similiar to one another. The skull is usually very asymmetrical, or laterally distorted; sometimes, as in *Physeter* and *Hyperoodon*, it is wonderfully modified by the development of raised ridges and crests on the maxillary bones.

The blow-hole is externally single, and no trace of an olfactory nerve can be distinguished. The anterior ribs are more closely united to the vertebræ than in the *Mystacoceti*; the sternum (in the young animal at least) is composed of several distinct segments, and it is attached to several of the ribs. The cervical vertebræ are, usually, nearly or quite free, but are sometimes completely united.

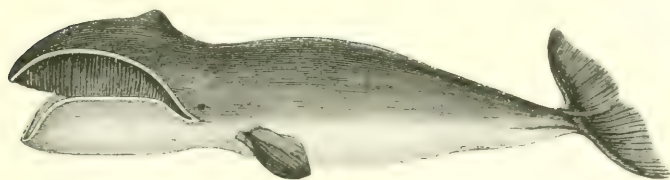
The *Odontoceti* have been divided by Prof. Flower into three great families; namely, *Physeteridæ*, consisting of the Cachelots and Ziphioid Whales; *Platanistidæ*, the long-snouted fresh-water Dolphins of India and South America; and *Delphinidæ*, comprising the remaining Dolphins, Porpoises, &c., along with the Narwhal and the Beluga. Of these groups the first and third are well represented in our fauna, while the second consists exclusively of tropical forms.

The Dugongs and Manatees of the tropics were formerly placed in this order, under the name of Herbivorous Cetaceans, but a better acquaintance with their organization has led to their separation as a distinct order, *Sirenia*, holding a close relation to the hoofed animals or *Ungulata*.

One or two specimens of the Manatee of the West Indies (*Manatus australis*) have been cast ashore on our islands, and the species has therefore been claimed as British, but as the animals were dead and even putrid, and had probably been drifted by the Gulf Stream from a great distance, it can have no claim to be regarded as a member of our fauna.

CETACEA.
(MYSTACOCETI).

BALÆNIDÆ.



GENUS BALÆNA (Linnæus, 1766).

Generic Character.—Baleen long; no dorsal fin; skin of throat and belly smooth; flippers short. Rostrum of skull much compressed and rounded; rami of lower jaw strongly arched outwards; cervical vertebræ ankylosed.

GREENLAND RIGHT-WHALE.

Balæna mysticetus (Linn.).

Specific Character.—Dark grey, the lower jaw and throat white. Head of adult one-third of the entire length; baleen long and narrow. Number of vertebræ 54, of ribs 13 pairs, rarely 14. Length of adult, 50 to 60 feet.

Balæna mysticetus, LINNÆUS, Syst. Nat. I. 105 (1766).

Arbek of Greenlander. *Akkek* of Western Esquimo.

THE term “Right-Whale” has been applied to the members of the restricted genus *Balæna*, these being the only animals which fully reward the whaler by a full supply of oil and whalebone of the best quality. From the next family, that of the Rorquals or Fin-Whales, the Right-Whales are at once distinguished by the absence of a dorsal-fin, and of folds or plicæ on the throat or belly. Their heads are also much larger—amounting to a fourth or even a third of their entire length, their baleen is longer and more valuable, their cervical vertebræ are ankylosed into a solid mass, and their flippers have five fingers.

It is only of late years that more than one species of Right-Whale has been established as inhabiting the northern seas, and as not one animal of this genus has been recorded as having recently occurred on our coasts, it is left a very doubtful question, which of the two recognized species of Northern Right-Whale is to be recognized as British? In this difficulty we have thought it best to include both in the present work, but must express the strong conviction that the animals which have occurred in Britain were of the more southern species, *B. biscayensis*. Still there is nothing more improbable in the idea that the truly glacial *B. mysticetus* may have accidentally wandered to our shores, than in the occasional appearance here of such arctic forms as the Narwhal and Beluga.

The notices of Right-Whales taken in British waters are unsatisfactory in the extreme. Sibbald records what was probably such an animal, and the Tynemouth specimen mentioned by Willughby may have been a true *Balæna*. In the "Natural History of Yarmouth," by Messrs. C. J. and J. Paget (1834), it is stated of "*Balæna mysticetus*, the Common Whale," that a small one was taken near that town on the 8th July, 1784, but no remains of this individual have been preserved, nor can any further particulars be now ascertained. The Rev. Mr. Barclay says of the same species, in a communication printed in the first edition of our work:—"It is occasionally seen on the coast of Zetland, and several of this species have run aground, or have been found dead at sea. These, however, were very lean, either from injury or disease or from want of food." There is no proof, however, that these references do not rather apply to some species of *Balænoptera*.

The labours of HH. Eschricht and Reinhardt have fully established the strictly arctic distribution of the

Greenland Right-Whale, which is almost invariably found close to the polar ice-fields, although it occasionally goes as far south in winter as north lat. 46° *. Not a single example is known with certainty to have wandered to the European coasts. This species was formerly very plentiful in the seas east of Greenland, but has been there nearly extirpated by the whalers; Herr Malmgren did not see one during his recent voyage to Spitzbergen. The principal fishing-ground is now in Baffin's Bay, and according to Dr. R. Brown the Whales are found in the greatest numbers in the vicinity of Eclipse Sound between the months of June and September, returning southwards to winter and produce their young in the southern parts of Davis Strait, Hudson Strait, and off the coast of Labrador (Proc. Zool. Soc. 1868).

One of the best accounts of the habits and chase of the Greenland Right-Whale is that given by the late Mr. Scoresby in his "Arctic Regions." According to his description this species is usually met with either solitary or in pairs, and he reckons its usual pace at about four miles an hour, although it is capable of a much greater speed when alarmed or wounded. At intervals of from five to fifteen or even twenty minutes it comes to the surface to breathe, and remains there for about two minutes. Of late years the introduction of steam and the invention of the gun-harpoon have revolutionized the chase of the Whale, but in its general character and incidents it remains much the same as in the days of Scoresby. When a Right-Whale is observed the boats are at once lowered and harpoon after harpoon is fixed in its body till it becomes exhausted and incapable of further diving, when it is attacked with lances. Then succeeds the awful scene of the "flurry" or dying convulsions,

* "Recent Memoirs on the Cetaceans," published by the Ray Society, 1866.

and then the mighty prey turns on its back in death, amidst the cheers of the successful whalers. No time is lost in towing it alongside the vessel, and the process of "flensing" or removing the blubber is at once proceeded with. The baleen having been removed, the lower jaw-bones, which are very rich in oil, are secured, and the remaining carcase, called by the whalers the *krang*, is set adrift, a prey to the beasts, birds, and fishes, which flock to an unwonted feast.

The food of the Greenland Right-Whale seems to consist exclusively of certain small species of Mollusks and Crustaceans which inhabit what is known to the whalers as the "green water" between the latitudes of 74° and 80°, and which feed in their turn on the minute *Dirotomaceæ* from which these seas derive their peculiar tint. Among the favourite prey of the Whale, Dr. Brown particularizes three species of Entomostraca, namely, *Cetochilus arcticus*, *C. septentrionalis*, and *Arpactes knoxii*. There is no good evidence that these Whales ever feed on vertebrate animals.

The female is said to go with young for nine or ten months, and to produce one young one, rarely two, early in spring, which she suckles for a whole year. Like all the other animals of this order she shows the warmest attachment to her offspring, and if it is harpooned she refuses to leave it, allowing herself to be killed almost without an effort to escape. Consequently, the whaler always strikes a "sucker" when he has the chance, making sure of afterwards securing the mother without difficulty.

The head of the Greenland Whale is extremely large, occupying one-third of the animal's entire length, and is narrow above, but very broad, flat, and rounded beneath. The eyes are remarkably small, and are placed near the

angles of the mouth; the upper lip dips down in front to meet the lower, which is enlarged at the sides to a depth of five or six feet, so as to cover the baleen when the mouth is closed. The blow-holes are in the form of two curved lines with their convexity towards one another, and the external openings of the ear are hardly perceptible. The body is bulky in front, largest about the middle, and tapers rather suddenly towards the tail; its front part is almost cylindrical, but the posterior portion is compressed, with a sharp angle or ridge above. The flippers are oval and somewhat short, the tail is of great breadth, semilunate, and deeply divided in the middle. The general colour of the adult is almost black, of the young bluish-grey, the lower jaw and throat are cream-colour or white, and there are sometimes irregular white markings on other parts of the body.

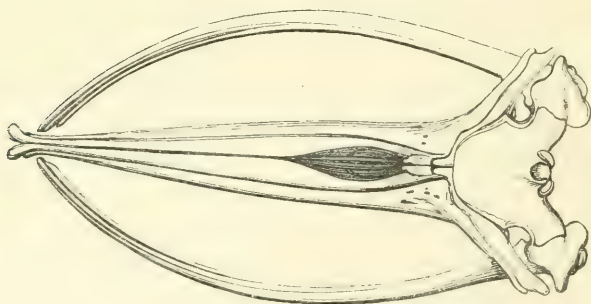
The longer blades of baleen usually attain a length of about twelve feet in the adult animal, but are sometimes considerably longer; their general colour is blackish-grey, occasionally varied with stripes of a paler tint.

The form of the skull, as seen from above, is shown in the vignette. The number of vertebræ is fifty-four, and there are thirteen pairs of ribs.

The length of the Greenland Right-Whale has doubtless often been exaggerated, but its bulk, so much greater than that of the Rorquals, probably entitles it to its old reputation of being "biggest of all live creatures." The females have been said to be larger than the males, but this view is not borne out by facts collected by Prof. Flower, who considers that fifty feet may be taken as the average length in both sexes. The following are some of the measurements of a very large female killed in Davis Strait, as given by Dr. R. Brown on the authority of Dr. R. Goodsir:—

Length (along curve of belly)	65 feet
Greatest girth	30 „
Length of head	21 „
„ of flipper (from head of humerus)	8 „
Breadth of tail	24 „

For a full account of the structure and geographical distribution of this species we may refer our readers to the paper “Om Nordhvalen,” by Professors Eschricht and Reinhardt, of which there is a translation in “Recent Memoirs on the Cetacea,” published by the Ray Society. A fine adult skeleton—that of a Whale taken near Holsteinborg in Greenland in the winter of 1861-2, is now mounted in the Museum of the Royal College of Surgeons of London.



CETACEA.
(MYSTACOCETI.)

BALÆNIDÆ.



ATLANTIC RIGHT-WHALE.

Balæna biscayensis (Eschricht).

Specific Character.—Uniform black. Head not more than one-fourth of the entire length. Angle of mouth depressed below the eyes; baleen short.

Balæna biscayensis, ESCHRICHT.

Sarde of the French, *Nordkaper* of the Dutch, *Sletbag* of the Icelanders.

IN our last article we have pointed out the difficulties which have arisen from the confusion of the two northern species of Right-Whale, and have expressed the opinion that the specimens which have occurred in British waters probably belonged to this—the more southern species. Be this as it may, there can be no doubt that the Atlantic Right-Whale was at one time a visitor to our coasts. We shall show that it was regularly pursued in the Channel in the middle ages, and the cervical vertebræ of a Whale, dredged up at Lyme Regis, in 1860, and now in the British Museum, are referred to this species by MM. Van Beneden and Gervais, but are made the type of a new species—*Macleayius brittanicus*—by Dr. Gray.

It is to the laborious researches of Professors Eschricht and Reinhardt, of Copenhagen, that we are indebted for the elucidation of the two northern species of *Balæna*. These gentlemen published the result of their investiga-

tions in 1861, under the title "Om Nordhvalen," in the Transactions of the Royal Danish Society of Sciences, and we have already referred to the translation of their invaluable paper in the volume of "Recent Memoirs on the Cetacea," edited by Prof. Flower. Since then the subject has been treated of by MM. Gervais and Van Beneden in their great work "*Ostéographie des Cétacés*," and by M. Fischer in the "Annales des Sciences Naturelles" for 1871.

It has always been known that a flourishing Whale-fishery was carried on by the Basques in the Bay of Biscay and the English Channel, as far back as the eighth and tenth centuries. These hardy and intrepid fishermen are said to have invented the harpoon, and it is certain that it was from them that the early Dutch whalers learned the use of that weapon. But the Whales became scarcer and scarcer, and the pursuit was gradually diverted to the Arctic Sea. The very natural conclusion to which Cuvier came, and which has been shared by most succeeding naturalists, was that the persecuted animals had retired from the temperate to the polar regions, whither they had been followed by their relentless assailants.

But HH. Eschricht and Reinhardt have been able to prove that the Greenland Right-Whale has not changed its habits or resorts within the last hundred years, the official records of the Danish colonies in Greenland showing that it frequents the same stations, and appears and disappears at exactly the same seasons of the year as it did ninety years ago. These facts seemed to point to the conclusion that the Right-Whale, now nearly exterminated in the temperate regions of the North Atlantic, was of a distinct species from the true *B. mysticetus* of the Arctic Circle, and as such it had always been regarded by the whalers. In old Icelandic manuscripts, mention

is made of the *Nordhval*, which appeared in winter, and of the *Sletbag*, seen only in summer. To the French the more southern species was known as the *Sarde*, and to the Dutch as the *Nordkaper*, under which latter name it was mentioned by several naturalists and travellers, as Egede, Crantz, Anderson, and others, who concur in describing it as having a much smaller head than the Greenland species, while its baleen was much shorter; it yielded less oil, and its skin was invariably disfigured by parasitic Cirripedes, which are never found on *B. mysticetus*. This "Nordkaper" seems now to be unknown in the Iceland seas, and Scoresby expressly states that he never met with it in any of his voyages. It seems probable that the "Black Whale" of the temperate shores of North America is identical with this species. It has been named *B. cisarctica* by Prof. Cope, but he regards it as closely allied to *B. biscayensis*—"if not the same." MM. Van Beneden and Gervais regard them as identical, but M. Fischer thinks they are probably distinct.

The notices and documents which establish the fact of the former abundance of the Atlantic Right-Whale in the Bay of Biscay and the English Channel, will be found quoted at length in the memoirs to which we have referred above. In more modern times the occurrences of the animal have been very rare. The most recent, and much the most important, was that of a female, accompanied by a young one, which entered the harbour of St. Sebastian on the 17th January 1854. The mother escaped, but the young one was secured, and it is on this example that our positive knowledge of the species principally rests. Dr. Monedero made a drawing of it, which is engraved in MM. Gervais and Van Beneden's work, and which we have copied as the only authentic representation of the species. The skeleton was also preserved, and was deposited

in the Museum at Pampeluna, where it remained till 1858, when it was purchased by Eschricht for the Copenhagen Museum. Its description has been delayed by the lamented death of that eminent naturalist, and is now eagerly awaited from the pen of his friend and survivor, Prof. Reinhardt.

In the Atlantic Right-Whale, the head is much shorter in proportion to the body than in *B. mysticetus*, not exceeding one-fourth of the entire length of the animal; the baleen is also much shorter. In these respects, as well as in the manner in which the angles of the gape are deflected below the eyes, it more nearly resembles the *B. australis* of the southern hemisphere. The colour appears to be always a uniform black, without any white markings.

As we have not seen any detailed description of the skeleton, now at Copenhagen, we are not able to point out the osteological characters in which it differs from *B. mysticetus*. The vertebral column is described as being much more massive, and the number of the vertebræ is stated to be different. The first rib is double-headed, and in consequence Dr. Gray has recently placed this species in his genus *Hunterius*, but it is now generally acknowledged that no reliance can be placed on this character in discriminating the species of Cetacea. Its extreme variability has been pointed out by Reinhardt, Van Beneden, and others, who have shown that it occasionally appears as an individual peculiarity in several species, as in *Balenoptera musculus* and *B. sibbaldii*, and also more rarely in *Orca gladiator* and *Delphinus delphis*, while it appears to be constant in one species only, namely, *Bal. laticeps*. Prof. Turner, in a paper in the fifth volume of the "Journal of Anatomy and Physiology," has shown good reasons for the belief that this character is owing to the ankylosis of

a rudimentary cervical rib with the true first dorsal rib, similar to a malformation occasionally met with in the human skeleton.

In size, the Atlantic Right-Whale is inferior to the Greenland species, and its average length may probably be estimated at about forty to fifty feet. The following measurements of the St. Sebastian young specimen are given by M. Fischer (*Ann. Sc. Nat.*, XV.) in metres and feet:—

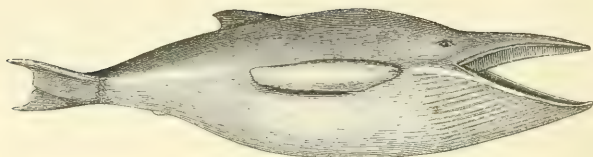
	M.	Ft. In.
Length from snout to tail	7.56	26 9
Circumference	4.92	17 5
Distance from snout to eye	1.45	5 2
Length of flipper	1.06	2 6

As already stated, our illustration is a copy of Dr. Monedero's drawing of this young specimen, as engraved in MM. Van Beneden and Gervais's "*Ostéographie des Cétacés.*" (*Atlas, pl. VII., fig. 1.*)



CETACEA.
(MYSTACOCETI.)

BALÆNOPTERIDÆ.



GENUS MEGAPTERA (Gray, 1844).

Generic Character.—Skin of throat and belly plaited; a low obtuse dorsal fin; flippers very long, equalling a fourth or even a third of the whole length, their edges undulated; lips marked by a row of tubercles; head broad and flat. Cervical vertebræ usually free, acromion of scapular absent or rudimentary.

HUMP-BACKED WHALE.

Megaptera longimana (Rudolphi).

Specific Character.—Black above, varied black and white below; flippers wholly white; baleen black. Vertebræ 53, ribs 14 pairs. Length of adult about 50 feet.

- | | |
|----------------------------------|---|
| <i>Balæna boöps</i> , | FABRICIUS (<i>nec Linn.</i>) Fauna Grœnl. (1790), 36. |
| ,, <i>longimana</i> , | RUDOLPHI, Mem. Acc. Berl., 1829, 133. |
| <i>Megaptera</i> ,, | J. E. GRAY, Zool. Erebus and Terror (1844), I., 17. |
| <i>Kyphobalæna boöps</i> , | ESCHRICHT, Nord. Wallthiere (1849), 146. |
| <i>Keporkak</i> of Greenlanders. | <i>Puckelhval</i> of Swedes. |

THE Hump-backs and Rorquals or Fin-Whales constitute the family *Balænopteriðæ*, distinguished by the longitudinal plaits or folds which mark the skin of their throats and bellies, and by the possession of a dorsal fin. In this family the head is relatively smaller than in the Right-Whales, and the jaws are less arched, the baleen is short and twisted, the vertebræ of the neck are usually separate, and the flipper has only four fingers. The

members of this group have been separated by recent writers into an immense number of subdivisions, but they appear to be referable to two well-marked genera, both of which are represented in our fauna.

Of these the first, *Megaptera*, includes the Whales known to sailors as "Hump-backs"; they have a somewhat bulky body, a broad head, and a very low and obtuse dorsal fin. The flippers are of extraordinary size, equalling a fourth or even a third of the whole length of the animal, and the second and third digits have no less than eight joints in each.

The Hump-backed Whale was not known to Linnæus, but appears to be the *Balæna boöps* of Fabricius. Although well known to whalers as the "Bermuda Whale" and "Hump-back," and to the Greenlanders as the *Keporkak*, it was not properly characterized until 1829, when Rudolphi figured and described it as *Balæna longimana*, from an example cast ashore at the mouth of the Elbe. Since then much has been done in clearing up its history, thanks principally to the labours of Holböll and of Eschricht.

The "Keporkak" is found, according to these observers, between the degrees of 62 and 66 north latitude in summer, but not one is to be seen off the Greenland coasts in winter. From March till May they are met with as far south as Bermuda, and the females are then accompanied by their young. Sometimes it wanders into the German Ocean, and even penetrates into the Baltic; Herr S. Hallas has seen it on the coast of Iceland, and Herr G. O. Sars among the Loffoden Isles, and Eschricht states that one was taken in Norway, near Stavanger, in April, 1846.

On our own shores, it may sometimes have been confused with the true Rorquals, but the occurrence of two

individuals is certainly known. Of these the first was cast ashore near Newcastle, 19th September, 1829, and was figured and described by Dr. G. Johnston in the first volume of the "Transactions of the Newcastle Natural History Society." It was a female of about twenty-six feet in length, and the contents of its stomach were not a little remarkable, consisting of six Cormorants, while a seventh, on which the Whale was supposed to have choked, was found in its throat; a few weeks before a Whale of fifty-eight feet came ashore at Holy Island, but the species was not ascertained. The second specimen, also a female, was taken in the estuary of the Dee in 1863, and its skeleton is now in the Free Museum of Liverpool. It measured thirty-one feet four inches, and its stomach contained shrimps. Some account of it was given by Mr. T. Moore in the "Naturalist's Scrap-book" for that year. In this specimen the second and third cervical vertebræ are ankylosed, which does not appear to be usually the case in this genus.

The Hump-backed Whale is neither shy nor fierce, and is easily killed. The Greenlanders attack it without harpoons, stealing alongside in their *Kajaks* and stabbing it with lances, but it is seldom persecuted by European whalers, both its blubber and whalebone being of very inferior quality. It feeds on various fish and mollusks, among which *Mallotus arcticus*, *Ammodytes tobianus* and *Limacina arctica* form its chief prey in the Greenland seas, to which Holböll adds *Gadus agilis* and various Crustaceans. Prof. Lilljeborg makes the following remarks on the habits of this species:—"It often, during calm weather, rests quietly on the surface of the water, sometimes lying on one side, beating itself with its pectoral fins, as if trying to rub away something that annoyed it; sometimes it jumps quite

out of the water, turns round in the air, and falls on its back, beating itself with the pectorals. It appears at times quite fearless, and swims round about the boats quite near to them, as if they were its comrades. The young follow the mother until she brings forth another, which is said not to take place every year, as very large young ones are sometimes seen with the mothers."

The head is larger in proportion than that of the Rorquals, and the upper jaw is smaller than the lower. The body is robust, near the tail it is much compressed. The blow-holes are two narrow slits, the eyes are placed close to the angles of the mouth, and the lips are marked by a row of tubercles of various sizes. The flippers are very long and are marked along their edges by prominences and depressions nearly corresponding with the joints of the concealed fingers. The dorsal fin is very low, often hardly more than a lump; the tail is broad and deeply notched. The throat and belly are marked by deep longitudinal plaits or grooves, but these are less numerous than in the true *Balenoptera*.

The upper parts are black, the lower are varied with black and white in streaks and patches; the pectorals are wholly white. The baleen is black with brownish bristles, and consists of about four hundred short blades on each side of the mouth. The number of vertebræ is fifty-three, and there are fourteen pairs of ribs.

According to Eschricht and Holböll, the "Keporkak" reaches a length of fifty or even sixty feet. Prof. Flower considers the usual length of the adult to range from forty-five to fifty feet.

The following are the dimensions of the Dee specimen as given by Mr. Moore:—

	Ft.	In.
Total length	31	1
Length of gape	8	0

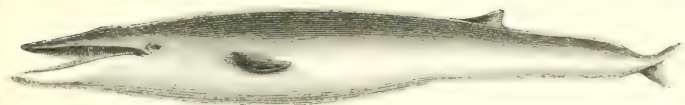
	Ft.	In.
From snout to flipper	11	0
Length of flipper	10	0
From snout to hump	18	0
Extreme width of tail	11	0

Our illustration is from the original figure given by Rudolphi, in the Memoirs of the Berlin Academy for 1829.



CETACEA.
(MYSTACOCETI.)

BALÆNOPTERIDÆ.



GENUS BALÆNOPTERA (Lacépède, 1804).

Generic Character.—Skin of throat and belly plaited; a well-defined compressed dorsal fin; flippers short, their edges even; head and body slender. Cervical vertebrae usually free, scapular with a distinct acromion and coracoid process.

COMMON RORQUAL OR RAZOR-BACK.

Balænoptera musculus (Linnæus).

Specific Character.—Black above, shaded to a brilliant white below; flippers black; baleen slate-colour, streaked with paler shades. Upper jaw pointed; dorsal-fin high, distinct. Vertebrae 61 or 62; ribs 15 pairs, the first usually single-headed; sternum trilobate, not longer than broad. Length of adult 60 to 70 feet, or a little more.

Balæna musculus, LINNÆUS, Syst. Nat. (1766), I., 106.

„ *antiquorum*, FISCHER, Syst. (1828), 525.

Physalus „ J. E. GRAY, P.Z.S. (1847), 90.

Keporkanuk of Greenlanders. *Rö-heal* of Swedes. *Razor-back* and *Fin-back* of English whalers.

THE second genus of *Balænopteriæ* contains the true Rorquals or Fin-whales, separated from the Hump-back by their more slender form, smaller head, and more distinct and compressed dorsal-fin, as well as by the comparative shortness of their flippers, of which the middle digits have not more than six joints.

The name Rorqual is derived from the Norse *Rorqual*, Swedish *Rörhval*, and means a whale with plaits or folds, alluding to the longitudinal ventral furrows so characteristic of this family. Several distinct species inhabit the more temperate northern seas, but have been much confounded with one another, owing to their great general resemblance, and to the individual variations found in animals of the same species. So much was this the case that in our first edition only one species was included, but with the remark that further observations were required to clear up the discrepancies found in the accounts of various writers. Since that time very much has been done, and at least four distinct species are now known to visit the European coasts, of which the present species appears to be the most abundant.

The Razor-back, or Common Rorqual, is a native of the more temperate northern seas ; although it is said to have been observed as far north as lat. 80° , its distribution is certainly much more southern than that of the Greenland Right-Whale. To the south of 70° north latitude it is much more frequently met with, and it is the only Balæmoid Whale which is known to enter the Mediterranean, a fact which at once identifies it with the *Mysticetus* of Aristotle and the *Musculus* of Pliny.* Although well known to the natives of Greenland and Iceland, it appears there irregularly and at all seasons. From time to time specimens are stranded or washed ashore on the coasts of Europe, and MM. Gervais and Van Beneden have given a long list of such occurrences. A female taken on the American coast is described by Dr. Dwight in the "Memoirs of the Boston Society of Natural History" for 1872.

* Since the above was written we have seen, in the Marseilles Museum, a skull of *B. rostrata*, which is labelled as having been obtained on the coasts of Provence.

On our own coasts a Finner of forty-six feet in length, and probably of this species, was taken in the Firth of Forth in November, 1690, and described by Sir Robert Sibbald as "*Balæna tripennis quæ rostrum acutum habet.*" Since that date many large Rorquals have occurred on all parts of our coasts, from Shetland to Cornwall, and from Western Ireland to Norfolk. Some of these may have belonged to the species next to be described, but latterly almost every specimen has been examined by competent observers, and in many cases a part at least of the skeleton has been preserved. Without attempting to give a full list of captures, we will note some of those in which the exact species has been best determined.

In Scotland the Common Rorqual seems to occur not unfrequently in the Orkney and Shetland Isles; three specimens taken in 1856 were fully described by Mr. Heddle in the Proceedings of the Zoological Society; these were made the types of a distinct species named *Physalus duguidii* by Dr. Gray, but their identity with *B. musculus* is now generally recognized. On the mainland of Scotland several examples have been recorded—of these one taken in the Firth of Forth in October, 1808, was described by the late Dr. Neil. In England more than a dozen examples have been recorded as having occurred within the last fifty years. The skeleton of one taken near The Needles in April, 1842, is exhibited at Black Gang Chine in the Isle of Wight, and that of one found floating dead in Plymouth Sound in 1831, is in the British Museum. The bones of a Razor-back taken at Margate in 1850, are preserved in the Museums of the Royal College of Surgeons and of the University of Cambridge—the former collection also contains a specimen obtained at Yarmouth in 1857, and the latter a male stranded in Pevensey Bay in 1865. Two other complete

skeletons are exhibited in the Metropolis, that of one taken in the Thames in May, 1859, being shown at Rosher-ville Gardens, and that of a male cast up near Falmouth in 1863 is mounted at the Alexandra Park. Specimens have been recorded on the Irish coasts.

The Common Rorqual, like the rest of the family, is remarkable for its strength and activity, swimming at the rate of twelve miles an hour and exhibiting little fear of man. As its baleen and blubber are inferior in both quantity and quality, it is generally avoided by the Whalers, who regard it as at once valueless and dangerous, and dislike its appearance as being a proof that they have not yet reached the waters frequented by the Right-Whale.

The Razor-backed Rorqual has a somewhat small head, the sides of the upper jaw gradually narrowing towards the apex. The upper parts, including the pectorals, are black, but owing to their polished surface appear in some lights to be grey; this dark colour is gradually shaded off on the flanks, and the throat and belly are white, the skin between the plicæ being of a rosy tint. The baleen is of a dark slate, variously streaked and variegated with brown or yellowish-white, especially in front, and the bristles on the interior edge of the plates are whitish. The hinder part of the body is much compressed, and the sharp ridges thus formed on the back and belly run out into the tail.

In the skeleton the sternum has somewhat the form of a trefoil, and is broader than it is long: there are usually sixty-one or sixty-two vertebræ, and fifteen pairs of ribs, of which the first is sometimes, though rarely, double-headed.

The adult Razor-back attains a length of sixty to seventy feet, or perhaps a little more. The following are some of the measurements of the male cast ashore at

Pevensey, as given by Prof. Flower in the Zoological Society's Proceedings for 1865 :—

	Ft.	In.
Extreme length in a straight line	67	0
From snout to flipper	21	0
Length of ,, 	6	9
Breadth of tail, about	13	0
Depth of body, 4 feet in front of tail	4	6

In the illustration at the head of this article we have given a copy of the figure published by Prof. Flower in the "Proceedings of the Zoological Society" for 1869, pl. XLVII., as being an authentic drawing of a well-identified specimen; indications of the local colouring have been added. The animal from which it was taken was found floating dead in the Channel, and its skeleton is now preserved at Portsmouth.

A young Rorqual taken on the coast of Wales in 1846 is the type of *Benedenia knoxii* of Dr. Gray. It has been ascribed to the present species by MM. Gervais and Van Beneden, and their identification has been generally accepted.



CETACEA.
(MYSTACOCETI.)

BALÆNOPTERIDÆ.



SIBBALD'S RORQUAL.

Balænoptera sibbaldii (J. E. Gray).

Specific Character.—Black above, shading into slate-grey below, more or less varied with whitish spots and markings; flippers black above, whitish below; baleen uniform deep black. Head broad; flippers long and broad; dorsal-fin distinct, but very low. Vertebrae 64; ribs 16 pairs, the first usually single-headed. Length of adult 60 to 80 feet or more.

Physalus sibbaldii,

Balæna borealis,

Sibbaldius borealis,

Physalus latirostris,

? “*Balæna tripinnis quæ maxillam*

inferiorem rotundam,” &c., SIBBALD, Nov. Phææn., 33 (1692).

Steypireythr of Icelanders.

J. E. GRAY, P.Z.S., 1847, 92.

(*In part*) FISCHER, Syn. 524 (1828).

GRAY, P. Z. S., 1864, 223.

FLOWER, P. Z. S., 1864, 410.

SIBBALD'S Rorqual, probably the largest of its family, has long been distinguished as a separate species by the Icelanders under the name of *Steypireythr*, but was first zoologically characterized by Dr. Gray, who in 1847 named it *sibbaldii* in honour of the distinguished Scotch cetologist of the seventeenth century. Since then very considerable additions have been made to our knowledge of its history and structure, chiefly by the labours of Professors Reinhardt, Flower, and Turner.

A large Fin-whale, seventy-eight feet long, which was stranded near Abercorn in 1692 and described by Sir Robert Sibbald, was probably of this species, as Prof. Turner suggests, but the description is not sufficiently detailed to set the question at rest. Coming down to the present century, we have to consider the huge Rorqual which was found floating dead in the North Sea in 1827 and taken to Ostend ; its skeleton was preserved and was exhibited in this country, whence it was shipped to America, and it is said to be now at St. Petersburg (*Gray, Zoologist* 1873, p. 3364). This "Ostend Whale" created much popular excitement at the time, and was described by several writers, as Dubar, Van Breda, Dewhurst, and others. Unfortunately several of its vertebræ had been lost, and the published descriptions of it are not trustworthy ; thus, its length has been variously stated at eighty-four, ninety-five, and a hundred and five feet ; consequently, its specific identity is difficult to determine. Eschricht named it *Balenoptera gigas*, and Dr. Gray *Sibbaldius borealis*, while MM. Van Beneden and Gervais refer it to *Bal. musculus*. Prof. Turner, in his paper on Sibbald's Rorqual in vol. XXVI. of the "Transactions of the Royal Society of Edinburgh," expresses the belief that the "Ostend Whale" was a large example of this species, an opinion in which Prof. Flower fully agrees. Four years later, in October 1831, a Fin-whale of about eighty feet in length was found dead near North Berwick, and its skeleton, prepared by the late Dr. Knox, is now in the Museum of Science and Art in Edinburgh. This has always been quoted as an example of *B. musculus*, but Prof. Turner has clearly shown that it, too, belongs to the present species.

In 1847, Dr. Gray described the skeleton of a young Rorqual taken in the Humber and preserved in the

Museum of the Hull Literary and Philosophical Society, as a new species, under the name of *Physalus sibbaldii*. In 1864 Prof. Flower bestowed the name of *Physalus latirostris* on a skeleton in the collection of the late Prof. Lidth de Jeude at Utrecht (now in the British Museum), but he soon became convinced that it was identical with the Hull specimen (*P. Z. S.* 1865, p. 472). In the course of the next year a Fin-whale, taken near Gothenburg in Sweden, was described by Prof. Malm as a new species—*B. carolinæ*—but it has been identified with *B. sibbaldii* by Professors Flower and Reinhardt, and their determination has been generally accepted.

On the 3rd November 1869, a large Rorqual stranded itself near Longniddry, in the Firth of Forth, and soon died. It was carefully examined and dissected by Prof. Turner, to whose papers in the "Transactions of the Royal Society of Edinburgh" we have already referred. This specimen proved to be a pregnant female of Sibbald's Rorqual, containing a male foetus of the length of nineteen feet six inches. The carcass was sold by the Board of Trade to an oil-merchant, and the skeleton, along with various anatomical preparations, were secured for the Edinburgh Museum. About the same time a female Fin-whale with its calf was stranded in Hamna Voe, Shetland, and some of its bones, afterwards secured by Prof. Turner, proved that it, too, belonged to this species.

The *Steypireythr* of the Icelanders has been clearly shown by Prof. Reinhardt to be identical with Sibbald's Rorqual, and in all probability the *Tunnolik* of the Greenlanders is the same. It is said to be constantly seen between 63° 40' and 66° 20' north latitude, and to be the most abundant Fin-whale about Iceland, where it is chiefly seen in summer. According to Holböll, it is plen-

tiful off the coasts of South Greenland, where it feeds principally on *Malotus arcticus*.

This species differs from the common Rorqual in many important external characters, as well as in its anatomy. The head is broad, the lower jaw both longer and broader than the upper. The dorsal-fin is very low and small, and the pectorals are long and broad. The baleen is entirely of a deep rich black, affording a good distinction from *B. musculus*, in which it is always grey, mottled with lighter tints. The colour of the upper parts is dark grey, almost black on the back and shaded off on the flanks; the lower parts are also grey, but of a paler tint, and irregularly mottled with whitish spots and patches. The flippers are dark above, whitish beneath.

In the skeleton, the rostrum of the skull is nearly half as broad as it is long. The sternum is small and trefoil-shaped and the bones of the flippers very long—so much so, that those of the Hull specimen of forty-seven feet are absolutely longer, says Prof. Flower, than those of a full-grown Razor-back of seventy feet. There are sixty-four vertebræ and sixteen pairs of ribs; in Prof. Lidth de Jeude's specimen there are only fifteen pairs, but in the Whales of this family the last rib is sometimes comparatively rudimentary, and is easily lost in preparing the skeleton.

That this species attains a very great size cannot be doubted, though many accounts are probably exaggerated. Holböll gives the length of the adult at sixty to eighty feet; Reinhardt says that six examples measured by Herr S. Hallas varied from seventy to eighty feet (Danish). The length of the "Ostend Whale," as already observed, has been very variously stated. The following are some of the measurements of the Longniddry specimen, as given by Prof. Turner:—

	Ft.	In.
Entire length, along curve of back	78	9
Girth behind flippers, about	45	0
Breadth of tail, about	16	0
Length of flipper along anterior margin	12	3
Girth of flipper at base	9	6

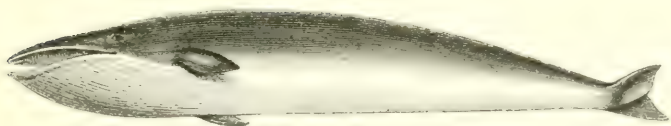
The weight of the carcase was estimated at about seventy-four tons, and it yielded sixteen tons of oil, the blubber being thicker than that of the Common Rorqual.

Our figure is a copy of the plate illustrating Prof. Turner's account of this specimen. As that gentleman has remarked to us, some allowance must be made for the fact that the animal was gravid, and consequently appears more bulky than would otherwise be the case.



CETACEA.
(MYSTACOCETI.)

BALÆNOPTERIDÆ.



RUDOLPHI'S RORQUAL.

Balænoptera laticeps (J. E. Gray).

Specific Character.—Black above, white below; upper surface of flipper black. Baleen black? Rostrum of skull very broad; vertebrae about 58; ribs 15 pairs, the first usually (or always?) double-headed. Length of adult 30 to 40 feet.

<i>Balæna rostrata</i> ,	RUDOLPHI (nec Linn.) Berlin Abhandl., 27 (1820).
<i>Balænoptera laticeps</i> ,	J. E. GRAY, Zool. Erebus & Terror, I., 20 (1844).
<i>Sibbaldius laticeps</i> ,	„ P. Z. S., 1864, 223.
? <i>Balænoptera boöps</i> ,	YARRELL, P. Z. S., 1840, 11.
? „ <i>tenuirostris</i> ,	SWEETING, Mag. Nat. Hist. 1840, iv. 342.

RUDOLPHI'S Rorqual is a small species, not much larger than the Lesser Rorqual, with which it was formerly confounded. Very little is yet known of its history and geographical distribution.

In 1820 Rudolphi described a specimen taken in Holstein under the name of *Balæna rostrata*; its skeleton is still preserved in the Berlin Museum. This was the “Rorqual du Nord” of Cuvier (*Oss. Foss.*, V., p. 564), to which Fischer gave the name of *Balæna borealis*, including the Ostend Whale in his description. But the distinction of Rudolphi's specimen was first clearly pointed out by Dr. Gray, in the “Zoology of the Erebus and Terror” in 1846, and other skeletons have since been found to belong to the same species.

Of these the oldest in point of date would seem to be that of a Fin-whale taken in the Zuider Zee in August 1811, and preserved in the Leyden Museum. The length is stated to have been thirty-two feet; the skeleton, as described by Prof. Flower in the "Proceedings of the Zoological Society" for 1864, is that of a young animal, and has fifty-five vertebræ, but the last consists of two or three bodies ankylosed; there are thirteen pairs of ribs, but the last pair seem to be wanting; the first have double heads. The next specimen in point of time is Rudolphi's, taken on the coast of Holstein in 1819; it was over thirty-one feet in length, the flippers were three feet six inches long and eight in. broad; the skeleton shows, according to Van Beneden, that the animal was not adult. A third skeleton, obtained by Eschricht from the North Cape, is stated by Prof. Flower to be in the Brussels Museum; it is about the same size as the one at Leyden, and is evidently that of a young animal. Some of the vertebræ are wanting, but the original number would appear to have been fifty-eight; there are thirteen ribs on the right side and fourteen on the left, the extra one being much thinner than the rest; the first pair have double heads. According to Prof. Lilljeborg, a fourth skeleton, that of a Whale taken on the coast of Norway in 1863, is preserved in the Museum at Bergen; the baleen of this example is stated to be black, and the species is said to be not unfrequent on the Norwegian coast.

In February 1840, a Whale was stranded at Charmouth, Dorsetshire, and was described by the late Mr. Yarrell, in the "Proceedings of the Zoological Society" for that year, under the name of *Balænoptera boöps*, and by Mr. Sweeting in the "Magazine of Natural History" as *B. tenuirostris*. Unfortunately the skeleton, which was preserved, has been lost sight of, and is believed to

have been sold for manure. This specimen was a female, forty-one feet long, black above and white below, the upper surface of the flippers black, and the baleen "bluish-black and yellowish-white." The number of the vertebræ was sixty, of the ribs fourteen pair, the first being double-headed. The identity of this Charmouth Whale has given rise to much difference of opinion; Mr. Sweeting, as we have seen, considered it a new species, Dr. Gray refers it, along with the Ostend whale, to *Sibbaldius borealis*, while MM. Van Beneden and Gervais regarded them both as *B. musculus*. Prof. Flower, we believe, considers that it must be referred to this species, and it certainly seems to come nearer to this than to any other described species.

In the Museum of the University of Cambridge there is a skull of a Rorqual which was cast ashore on the Island of Islay in 1866, which MM. Van Beneden and Gervais refer to this species, but it has not yet been properly described or figured. In the Museum of the Royal College of Surgeons there are several bones undoubtedly belonging to *B. laticeps*, but their history is quite unknown, and it is impossible to discover whether they are British or not.

Rudolphi's Rorqual has the upper jaw wide, and the dorsal-fin small. Its colour is black above, pure white beneath, the upper surface of the flippers being black without any white band. The baleen in the Bergen skeleton is black.

In the skeleton the normal number of vertebræ would appear to be fifty-eight, and of ribs fourteen pairs; the bifurcation of the heads of the first pair, found as an individual peculiarity in other Fin-Whales, has been found in every specimen of this species which has yet been described. The rostrum of the skull is very broad, the

outer edge being nearly as wide as the mandible. The bones generally are somewhat slender and dense in structure.

The following are some of the measurements of Rudolphi's specimen, and of the Charmouth example :—

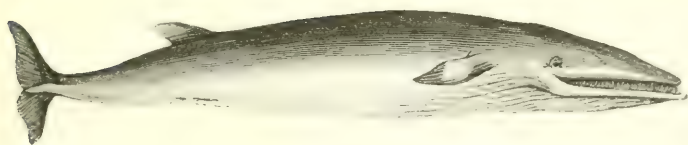
	Rudolphi.		Yarrell.	
	Ft.	In.	Ft.	In.
Entire length	31	1	41	0
From nose to flipper	9	0	10	9
Length of „	3	6	5	6
Breadth of „	0	8	1	6

Our illustration is a copy of the only figure of this species with which we are acquainted, drawn from Rudolphi's original specimen, and published in Brandt and Ratzeburg's "Medizinische Zoologie" (Vol. I., pl. XV., fig. 3), under the name of *Balæna rostrata*; as the back is turned from the spectator the dorsal-fin is not shown.



CETACEA.
(MYSTACOCETI.)

BALÆNOPTERIDÆ.



LESSER RORQUAL.

Balænoptera rostrata (Fabricius).

Specific Character.—Black above, white below; flippers black, with a broad white band across the middle; baleen yellowish-white, tinged with pink in the live animal. Vertebrae 48; ribs 11 pairs; sternum in form of a cross, longer than broad. Length of adult 25 to 30 feet.

Balæna rostrata, FABRICIUS, Fauna Grœnl. (1790), 40.

Rorqualus minor, (KNOX) Naturalist's Library, xxvi. 142.

Tikagulik of Greenlanders and Eskimo; *Tschikagulk* of Alaskan Indians? *Vaagechal* of Norwegians; *Seigral* or *Seival* of Finns; *Little Finner* and *Pike Whale* of whalers.

THE Lesser Rorqual was first described by Fabricius under the name of *Balæna rostrata*; Martens, also, distinguished it in his Spitzbergen voyage and speaks of it as the "Kleyne Walvisch" or Little Whale. John Hunter examined a specimen taken in the Thames, and gave a good figure, of which our illustration is a copy, in the "Philosophical Transactions" for 1789. The two Cuviers, however, having seen no specimens, regarded the Lesser Rorqual as the young of a larger species, but it is now well established as one of the best marked and most easily distinguished species of the family.

This small Fin-Whale is an inhabitant of the North Atlantic and Arctic Oceans, and Eschricht believes it to

be identical with the *Tschikagulk* of the Alaskan Indians, which visits Kamschatka and the Aleutian Islands. On the western shores of America it occurs at Labrador, and one taken in New York Bay is recorded by Dekay. It appears regularly in Davis Straits, and on the coasts of Iceland, Greenland, and Norway; in the latter country it is killed every year in the fjords near Bergen, where it is called the "Summer Whale" from its being seen only at that season; and in Finland it is known as the *Seigval* or "Cod-Whale." Further to the south it only appears as an accidental straggler, specimens having been recorded to have occurred in the Baltic and on the coasts of Denmark, Holland, Belgium, and France.*

In Britain the first specimen of the Lesser Rorqual of which we have authentic knowledge was a young one, seventeen feet long, which was taken on the Dogger Bank and described by John Hunter; its skeleton is now preserved in the Museum of the Royal College of Surgeons, as is also that of one stranded at Cromer, in Norfolk, in 1860. Another, a young female under fourteen feet in length, was taken in the Thames in October 1842, and is now in the British Museum. The skeleton of one taken at Lynn is in the Museum of the University of Cambridge, and there is also a British skeleton in that of Oxford. A young one of ten feet long, taken in the Firth of Forth in 1834, was described by Dr. Knox, who clearly pointed out its specific distinction from his "Great Northern Rorqual;" its skeleton is now in the Museum of Science and Art at Edinburgh. Other examples are recorded as having occurred in Shetland, Fifeshire, Lancashire, Cornwall, and Ireland. In the Andersonian Museum at Glasgow there is a Whale's skull, found in

* It also appears to have been taken in the Mediterranean. (*See footnote to p. 398.*)

brick-clay near Stirling, which is probably to be referred to this species.

Little has been observed of the habits of the Lesser Rorqual, which are probably similar to those of its huge relatives. It is usually seen alone, and more than two or three rarely go together. It is observed in Norway that many more females are killed than males, the reason probably being that the former seek the shelter of the coast to bring forth their young. According to Eschricht, the period of gestation is ten months, and the new-born young is about nine feet in length; instances of two young ones being found are on record.

In the Norwegian fjords the "Waagehval" is watched into narrow bays or creeks, the entrances of which are then secured and the poor animals die a lingering death under the darts and harpoons of the fishermen.

In form this species resembles the other Rorquals. The baleen is short and of a uniform yellowish-white. The upper parts are dark lead-colour or black, the chin and belly pure white. The flippers are black, with a broad white band across the middle. This appears to be constant, and to afford a good specific character.

In the skeleton the number of vertebræ is forty-eight, and there are only eleven pairs of ribs. The cervical vertebræ are usually all separate, but two or three of them are sometimes partially united. The sternum is in the form of a Latin cross, and is longer than broad.

The usual length of the adult appears to be from twenty-five to thirty feet, and none have ever been recorded which have exceeded thirty-one feet. In freshly killed specimens the baleen is often strongly tinged with pink; this is owing, according to Prof. Turner, to the presence of blood in the tubes which extend throughout the substance of the blades.

The following are some of the measurements of the

young female, taken in the Thames in October 1842, as recorded in the "Zoologist" for 1843, p. 33:—

	Ft.	In.
Entire length	14	8
Length of upper jaw	2	8
,, lower jaw	2	11
,, flipper	2	0
Breadth of tail	3	10

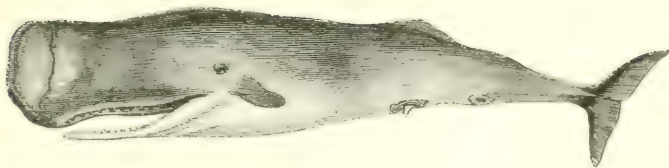
Our figure is from Hunter's original plate in the "Philosophical Transactions" for 1789.

A very complete account of the anatomy of the Lesser Rorqual is given by Drs. Carte and Macalister in the "Philosophical Transactions" for 1868.



CETACEA.
(ODONTOCETI.)

PHYSETERIDÆ.



Genus PHYSETER (Linn., 1766).

Generic Character.—Head enormously large, truncated; no distinct dorsal fin. Edges of maxillary bones elevated, enclosing a hollow basin in front of the skull. Lower jaws united by a symphysis of nearly half their whole length. Teeth of upper jaw rudimentary or absent, those of lower jaw numerous, large, and conical.

SPERM-WHALE OR CACHELOT.

Physeter macrocephalus (Linnæus).

Specific Character.—Black above, shaded to grey beneath. Vertebrae 49–50; ribs 10 pairs. Length of adult male 60 to 70 feet, female much smaller.

Physeter macrocephalus,

LINNÆUS, Syst. Nat., I., 107 (1766).

Catodon „

LACÉPÈDE, Hist. Nat. des Cèt., t. 10 (1804).

„ *australis*,

WALL, “New Sperm Whale” (Sydney, 1851).

? *Balæna macrocephala tripinna*, SIBBALD, Phal. Nov., t. 2.

! *Physeter tursio*,

LINNÆUS, Syst. Nat., I., 107.

THE history of the Sperm-Whale or Cachelot has been involved in much confusion, and several distinct species have been discriminated by various writers. Of these the most remarkable is the so-called “High-finned Cachelot,” of which two examples are said to have occurred on the Scotch coast in the years 1687 and 1689, which were described by Sir Robert Sibbald under the name of *Balæna macrocephala tripinna*. These animals are stated

to have had a high dorsal fin "like the mizzen-mast of a ship," but they were not examined by Sibbald himself. Although such a Whale has been since recorded as being *seen* by various observers, not a single specimen has ever fallen into the hands of any naturalist, and as Dr. Gray observes, "there is not a bone, nor even a fragment of a bone, nor any part that can be proved to have belonged to a specimen of this gigantic animal, to be seen in any museum in Europe." In spite, therefore, of Sibbald's well-earned character for accuracy, it is evident that *Physeter tursio* must be dismissed—at least provisionally—as an ill-established species. The Cachelot of the southern hemisphere was separated, in 1851, under the name of *Catodon australis*, Wall, but its distinction from the northern Sperm-Whale is very doubtful. Prof. Flower, in an exhaustive memoir "On the Osteology of the Cachelot," published in the sixth volume of the "Transactions of the Zoological Society," has carefully compared skeletons from Tasmania and Britain, and fails to find any characters of specific value by which to distinguish them, though he does not deny that the animals may yet prove distinct in their outward organization. Meantime it is evident that we must revert to the views of Cuvier, and admit only one species of this genus as being yet clearly established. The genus *Kogia* of Gray, inhabiting the southern seas, is a very distinct form, but at present is only imperfectly known.

Instead of inhabiting the Arctic and Antarctic seas, as was formerly stated, the Sperm-Whale is a native of the tropical and warmer temperate latitudes, from which it occasionally wanders, both northwards and southwards. The principal fisheries are carried on in the southern hemisphere. Stray examples have often wandered to the European shores, and these, as pointed out to us by Prof.

Flower, have almost invariably been old bulls, which had probably been driven from the herds or shoals, like the "rogue Elephants" of India, and forced to live a solitary and wandering life. Occasionally, however, a whole herd has strayed as far as Europe; a "school" which entered the Adriatic in 1853 is recorded by Heckel, and in the last century no less than thirty-one were stranded on the coast of Bretagne.

In Britain a considerable number of occurrences have been recorded from the time of Gesner up to the present day, both on the English and on the Scotch and Irish coasts, of which we shall only note those in which the animal was best observed. One ran ashore in the Firth of Forth in 1769, and an excellent figure and description was published by Mr. Robertson of Edinburgh in the "Philosophical Transactions." In 1788 no less than six were found dead on the Kentish coast, and others on the shores of Holland, after a northerly gale; these were all decayed, but a live one ran ashore at the same time in the River Thames (*Letter to Sir J. Banks, quoted by Dr. Gray*). A large male was stranded at Holderness, Yorkshire, in 1825, and its skeleton is preserved in the park at Burton-Constable, the seat of Sir Clifford Constable, Bart.; this specimen was described by Dr. Alderston in the second volume of the "Cambridge Philosophical Transactions," and the skeleton has since been examined by Prof. Flower. Another old bull, sixty-two feet in length, was cast up on the Kentish coast in February 1829, and its skeleton was prepared for the Zoological Society's Museum, but litigation arose as to the ownership of this mighty "flotsam and jetsam," and the bones were left on the shore till they were all washed away by the waves. In May of the same year one was captured in Argyleshire near Oban, and its jaws are still

preserved at Dunstaffnage Castle, as recorded by Prof. Turner. The much decomposed carcase of a large male was washed ashore in Caithnessshire, near Thurso, in July 1863, and its skeleton, which was presented by Capt. Macdonald to the British Museum, is described by Prof. Flower in his memoir. Lastly, a large example was stranded in Loch Scavaig, Isle of Skye, in July 1871, and a portion of its skeleton was secured by Prof. Turner, as recorded by him in the Proceedings of the Royal Society of Edinburgh.

The Sperm-Whale is well known as yielding the peculiar and useful substance from which it takes its common name. The general form of its skull, which is larger in proportion to the body than that of any known animal, has been aptly compared by Mr. Flower to "a huge pointed slipper, with a high heel-piece and the front part trodden down." The concavity of this "slipper" is formed by the raised edges of the maxillary bones, and in it lies the "spermaceti," contained in a thick bag divided into compartments by membranous partitions. This spermaceti, or "head-matter" as it is called by the whalers, is in a fluid state when the animal is alive, and when a Whale is killed an opening is made in the upper part of its head and the liquor is baled out in buckets, but it solidifies on cooling. Another substance of some value is produced by this animal, called, from its colour and smell, *ambergris*. It is found in the intestines, or more frequently is collected on the shores of those seas which are frequented by the Cachelot. There is now no doubt that ambergris is a kind of bezoar, formed from the cuttlefish, which form the principal food of this species, the nucleus of the mass being usually the beak of one of these Cephalopods. It was formerly used in medicine, but is now wholly neglected, as being useless and nearly

inert, but is still largely used as a perfume and commands a high price.

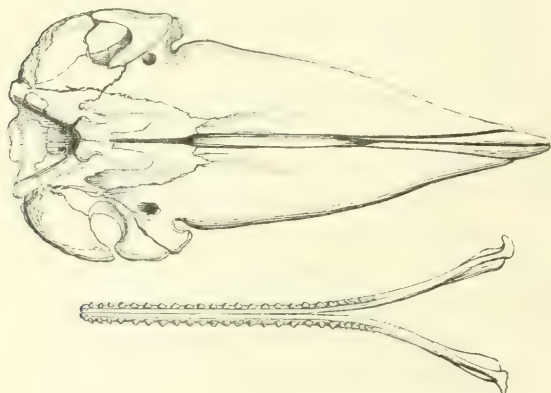
Interesting accounts of the habits and chase of this animal are to be found in Beale's "History of the Sperm-Whale" and Bennett's "Whaling Voyage." It is a gregarious creature, the sexes usually keeping apart in distinct "schools," which roam through the high seas and are rarely found near land. Its food seems to consist principally of cephalopode mollusks, though it also devours fish. When undisturbed it usually swims slowly, just below the surface, but when it moves at a more rapid rate the head is shown above the water at every stroke. When it "blows" the cloud of vapour is said to be visible at a distance of four or five miles. Its pursuit is even more dangerous than that of the Right-Whale; not only are boats often destroyed, but there is at least one authentic instance of an infuriated Sperm-Whale charging a large vessel and staving in her bows with its head. In fact, as Lowe quaintly says, "all the kind seem to be very mischievous."

The head of the Sperm-Whale is of most enormous size, forming about half the entire bulk of the animal, the principal amount of this mass consisting of cavities divided by membranous septa and filled with fluid sperm-aceti, lying in the anterior cavity of the skull. The snout is abruptly truncated; above it, and a little to the left, the single blow-hole is situated on a protuberance. The upper jaw, which overhangs the lower by some four or five feet, is usually without visible teeth in the adult. The lower jaw is extremely narrow, the symphysis between its branches continuing for the greater part of its length, and is furnished with twenty to twenty-five large conical teeth on each side. The body tapers from the head to the tail. The back has no distinct dorsal-fin, but

there is a protuberance not far from the tail, and sometimes one or two smaller ones. The flippers are small and slightly grooved longitudinally; the tail is very broad and divided into two equal lobes. The upper parts are very dark, almost black, the sides lighter, and the belly silvery grey.

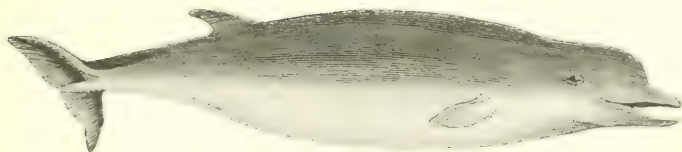
The usual length of the adult males appears to be about sixty feet, the largest authentic measurement given by Bennett being seventy-six feet in length by thirty-eight in girth. Females are stated by Beale to be very much smaller than the males, and Prof. Flower remarks that very small but apparently adult jaws are preserved in museums, which are either those of females or indicate a distinct and smaller species.

The skeleton has forty-nine or fifty vertebræ and ten pairs of ribs. The best description of the osteology of the Sperm-Whale is contained in the paper by Mr. Flower to which we have so often referred.



CETACEA.
(ODONTOCETI.)

PHYSETERIDÆ.



Genus HYPEROODON (Lacépède, 1804).

Generic Character.—Front rounded, convex; a distinct beak; mouth small. Flippers small, dorsal fin low and very far back. Skull with two great bony crests on the maxillaries, nearly or quite as high as the occipital portion. No teeth in the upper jaw, those in the mandible two or three in number, small and concealed by the gum. Cervical vertebrae united.

COMMON BEAKED-WHALE.

Hyperoodon rostratus (Chemnitz).

Specific Character.—Nearly black, paler on belly. Teeth $\frac{0}{11}$. Skull with the maxillary crests narrow, widely separated, and not higher than the occipital portion.

<i>Balæna rostrata</i> ,	CHEMNITZ, Berlin Besch., iv., 183 (1778).
<i>Hyperoodon butzkopf</i> ,	LACÉPÈDE, Hist. Nat. des Cèt., 319 (1804).
<i>Delphinus bidens</i> ,	TURTON, Brit. Fauna (1807).
<i>Heteroodon hyperoodon</i> ,	LESSON, Man., 419 (1827).

THE remarkable group of Cetaceans known as Ziphioid Whales hold in many respects an intermediate position between the Cachelots (along with which they form the family *Physeteridae*), and the Dolphins and Porpoises. Few species of this family are now known to exist, and with one exception they all appear to be very rare animals, but they were abundant in the later geological epochs, and especially at the period of the Crag formations. These facts, in the words of Prof. Flower's recent memoir

on the group in the Transactions of the Zoological Society, "lead to the belief that the existing Ziphioids are the survivors of an ancient family which once played a far more important part than now among the Cetacean inhabitants of the ocean, but which have been gradually replaced by other forms, and are themselves probably destined ere long to share the fate of their once numerous allies or progenitors." They are at once distinguished from other toothed Whales, by many important structural differences both external and internal. In the upper jaw there are no functional teeth, which are only occasionally represented by rudiments, which never cut the gums, while those of the lower jaw are reduced to either one or two pairs, which are often greatly developed but sometimes remain almost rudimentary. The snout is produced into a more or less distinctly marked "beak," the flippers are short and rounded and the dorsal-fin placed very far back. The blow-hole is crescentic, and two diverging furrows in the skin of the throat assume the form of the letter V with its angle directed forward. The family has been separated into an enormous number of genera, only four of which are recognized in Prof. Flower's paper. Of these the first and best marked is *Hyperoodon*, characterized by great bony crests which rise from the upper surface of the maxillary bones of the skull, by the rudimentary condition of the only pair of teeth which it possesses, and by the small hard horny tubercles which cover its palate.

The Common Beaked-Whale or "Bottle-head," as it is usually called, is by far the best known species of the family. It is a native of the North Atlantic Ocean, and goes as far north as Greenland in summer. In autumn it constantly comes into British waters, and specimens are killed almost every year on some part of our coast. One

was taken in 1783 in the Thames above London Bridge, and our illustration is a copy of the figure of this individual published by John Hunter in the Philosophical Transactions for 1787; its skeleton is still in the Museum of the Royal College of Surgeons. Skeletons of British killed specimens are also to be found in most of the larger provincial Museums, both in England and in Scotland and Ireland.

The Beaked-Whale, like its immediate allies, appears to be solitary in its habits, never being found in large herds, but either singly or in pairs. Those taken on our coasts are usually females or young ones; the old bulls, being very shy, are rarely secured. The food of this species is principally cuttle-fish, immense numbers of the horny beaks of these mollusks are usually found in its stomach, often closely packed one inside the other.

The female has usually a single calf, which is born late in autumn.

The front is obtusely rounded, being supported by the great maxillary bones of the skull, the snout or beak is depressed and pointed, the blow-hole crescentic, concave in front. The flippers are small and rounded, and the small dorsal-fin is placed very far back. The general colour is a uniform deep black, the lower parts being somewhat lighter.

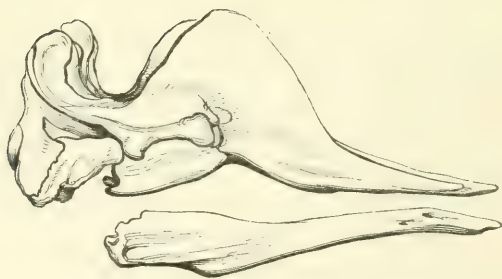
The two teeth in the lower jaw are small, conical, and permanently concealed by the gum; during foetal life they are more numerous, but all save this pair are absorbed before birth. The extraordinary appearance of the skull, caused by the great maxillary crests, is shown in the vignette to this article.

The adult Beaked-Whale attains a length of from twenty to twenty-six feet. The following are some of the measurements of a large female taken at

Weston-super-Mare, as supplied to Dr. Gray by Mr. Crotch :—

	Ft.	In.
Entire length	26	0
Girth at dorsal-fin	11	0
Length of flipper	2	0
Height of dorsal-fin	1	5
Breadth of tail	7	0

A detailed description of the anatomy of this species, accompanied by excellent plates, is given by Prof. Vrolik in the “Natuur-kundige Verhandelingen” of Haarlem, for 1848.



CETACEA.
(ODONTOCETI.)

PHYSETERIDÆ.

BROAD-FRONTED BEAKED-WHALE.

Hyperoodon latifrons (J. E. Gray).

Specific Character.—(External characters unknown.) Skull with the crests of the maxillaries flat-topped and very thick, almost touching one another, higher than the occipital region of the skull.

Hyperoodon latifrons, J. E. GRAY, Zool. Erebus & Terror, I., 27 (1846).
Lagenocetus ,, ,, Proc. Zool. Soc., 1863.

IN 1846 Dr. Gray figured and described, in the "Zoology of H.M.S. Erebus and Terror," the skull of a *Hyperoodon* from Orkney, which appeared to him to be different from the common species, and bestowed on it the name of *H. latifrons*. Subsequently he considered it worthy even of generic distinction, and instituted the genus *Lagenocetus* for its reception. The skull originally described, which was formerly in Mr. Warwick's collection, is now in the British Museum.

Prof. Eschricht, M. Gervais, and other cetologists, have doubted the distinctness of *H. latifrons* from the more common *H. rostrata*, believing that it is the adult male of that species, an opinion which is apparently supported by the fact that almost all the examples of *H. rostrata* which have come under the observation of naturalists have been females. But Dr. Gray has shown that both sexes of both species are known (*Proc. Zool. Soc.*, 1860, p. 424), and Prof. Reinhardt, who has lately received a complete skeleton from the Færoes, considers

it to be a well-established species (*Vidensk. Selsk. Skrift.*, vol. V.).

Besides the skull from Orkney in the British Museum, there is a skeleton in the Museum of Science and Art at Edinburgh which Dr. Gray has identified with this species; this is stated by Mr. W. Thomson (*Ann. and Mag. Nat. Hist.*, XVII., 153) to have belonged to a *female* twenty-eight feet six inches long which was taken in the Firth of Forth on the 28th October 1839, accompanied by a young male. Dr. Gray also mentions one taken in Morecamb Bay, Lancashire, the imperfect skull of which is preserved in a garden near Lancaster. The large Bottle-head described by Hunter was in all probability of this species; unfortunately the skull, which he says was in his collection, has disappeared, and only a portion of the lower jaw is now in the Museum of the Royal College of Surgeons.

Beyond our own seas the Broad-fronted Beaked-Whale has been taken in Greenland, whence there are skeletons in the Museums of Newcastle and Copenhagen, and the Færoes, as mentioned by Prof. Eschricht. We believe also that the skull of a French specimen is in the Caen Museum.

Nothing has been recorded of the outward appearance of this species, which is known only from its bones. The principal distinctive characters of the skull lie in the great raised crests of the maxillary bones, which are very much thickened and flattened above, so as almost to touch one another, whereas, in *H. rostrata*, they are rather sharp-edged above, and separated by a considerable interval. In *H. latifrons* these crests rise absolutely *higher* than the occipital region of the skull, which is not the case in the common species.

This animal appears to be considerably larger than the

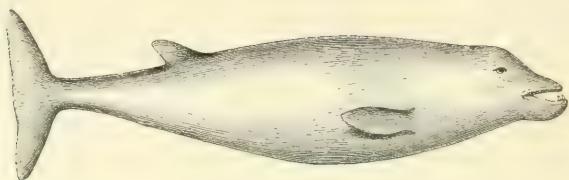
Common Hyperoodon, and probably attains a length of upwards of thirty feet. Our figure of the skull is from the original plate in the "Zoology of H.M.S. Erebus and Terror."



CETACEA.

PHYSETERIDÆ.

(ODONTOCETI.)



Genus ZIPHIUS (Cuvier, 1825).

Generic Character.—Teeth $\frac{0}{1,1}$ conical, placed in front of lower jaw, inclined forwards, of moderate size. Skull with a deep hollow at base of rostrum, into which the nares open, formed by the premaxillaries, and overhung above by the nasal bones. Rostrum tapered, triangular.

CUVIER'S WHALE.

Ziphius cavirostris (Cuvier).

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| <i>Ziphius cavirostris</i> , | CUVIER, Ossem. Foss., I., 350 (1825). |
| ? <i>Hyperoodon gervaisii</i> , | DUVERNOY, Ann. des Sc. Nat., XV., 49 (1851). |
| ? <i>Epiodon desmarestii</i> , | J. E. GRAY, Cat. Seals and Whales, 341 (1866). |

THE first occurrence of this very interesting species on the British coasts has lately been recorded by Prof. Turner of Edinburgh, to whose kindness we are indebted for an early copy of his paper in the "Transactions of the Royal Society of Edinburgh" for 1872.

In 1870 a small Whale was taken off Hamna Voe, on the North-west of the mainland of Shetland, and its skull was purchased, along with other cetacean bones, by Prof. Turner from Mr. J. Anderson of Hillswick. When it arrived in Edinburgh it was still covered with the hardened integuments, but on being cleaned it proved to belong to the species described by Cuvier as

Ziphius cavirostris, and Prof. Turner was thus enabled to make a most important addition to the list of British cetaceans.

Cuvier's Whale was first described by that great zoologist from a skull found in 1804 on the Mediterranean coast, in the department of Bouches-du-Rhône, and is the type of the genus. It was then believed to belong to an extinct animal, but several examples have since occurred on the southern and south-western coasts of France. A Whale stranded in Corsica, and described by M. Doumet in 1842 as a *Hyperoodon*, is proved by its skeleton, which is preserved at Cette, to belong to the same species. One came ashore in May 1850, in the department of Hérault, and has received the names of *Hyperoodon gervaisii* (Duvernoy), and *Epiodon desmarestii* (Gray), but it was regarded by M. Gervais as identical with *Z. cavirostris*. A skull found on the shore of the Bay of Arcachon in 1864, and preserved in the Museum of that town, is recorded by M. Fischer; and Prof. Flower, in his paper "On Ziphioid Whales" in the "Transactions of the Zoological Society (Vol. VIII.)," informs us that a fifth specimen was taken at Villa Franca in 1867, and that its skeleton, which has not yet been described, is now in the Museum of the University of Jena. There is also a complete skeleton of a Swedish specimen in the Stockholm Museum, as mentioned by Herr Malm in a recent paper in "The Proceedings of the Royal Swedish Academy."

Besides these European specimens, remains of recent *Ziphius* have been brought from the Cape of Good Hope and the east coast of South America; these have received the names of *Z. indicus* (Van Beneden), *Petro-rhynchus capensis* (Gray), and *Epiodon australe* (Burmeister). The identity of these with Cuvier's *Ziphius* must remain

an open question until further materials and observations have been collected; but Prof. Turner is meantime inclined to believe that they are all identical with *Z. cavirostris*, and that that animal has as extended a geographical range as the Cachelot.

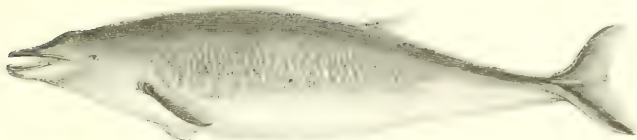
If Risso's *Delphinus desmarestii* (Eur. Mérid., III., p. 24) is identical with this species, as seems probable, the colour is steel-grey with irregular white streaks—in fact similar to that of Sowerby's Whale. Doumet describes his Corsican specimen as having the jaws covered with small hard tubercles.

Our illustration is a copy of Doumet's figure (*Revue Zoologique*, 1842, pl. I., fig. 2); the vignette represents the Shetland skull as figured by Prof. Turner.



CETACEA.
(ODONTOCETI.)

PHYSETERIDÆ.



Genus MESOPLODON (Gervais).

Generic Characters.—Teeth $\frac{0}{17}$, placed some distance from front of lower jaw, compressed, inclined forwards, sometimes very greatly developed. Skull with no hollow at base of rostrum, the nares opening directly on the surface; rostrum very slender.

SOWERBY'S WHALE.

Mesoplodon sowerbiensis (De Blainville).

Specific Character.—Black above, white below, sides marked with vermicular white streaks. Teeth moderate, visible externally. Flippers and dorsal-fin small, vertebrae 38, ribs 10 pairs. Length of adult 15 to 18 feet.

Physeter bidens,

SOWERBY, Brit. Miscell., t. I. (1804).

Delphinus sowerbiensis,

BLAINVILLE, Nouv. Dic. Nat. Hist., IX.,
177.

Delphinorhynchus micropterus, F. CUV., Hist. Nat. des Cèt., 114 (1836).

Mesoplodon sowerbiensis,

GÉRAIS, Zool. et Pal. Franç., 291 (1859).

THE first example of this species which came under the attention of naturalists was an adult male, sixteen feet in length, which was cast ashore in 1800 on the estate of James Brodie, Esq., of Brodie, Elginshire, the skull of which, along with a drawing of the animal, was forwarded by that gentleman to the late Mr. Sowerby, who figured and described it, in 1804, in his "British Miscellany," under the name of *Physeter bidens*. The skull, which is

imperfect, is now in the Museum of the University of Oxford. Another male, about fifteen feet long, was stranded in March 1864, in Brandon Bay, County Kerry, and photographs of its head were taken by Dr. Busteed, which have been engraved by Mr. W. Andrews, in vol. XXIV. of the "Transactions of the Royal Irish Academy;" its skull is now in the Museum of the Royal Society of Dublin. Another specimen, seventeen feet in length, was taken in the same place in May 1870, the skull and some of the bones of which are now at Dublin; and Dr. Gray mentions, in the "Annals and Magazine of Natural History" for August 1872, that he has been informed by Mr. Andrews of the occurrence of a third individual on the west coast of Ireland, the complete skeleton of which has been received at the Dublin Museum. In the Museum of Science and Art at Edinburgh there is a skull of this animal of which the history is unknown, but Prof. Turner, who has minutely described it in vol. XXVI. of the "Transactions of the Royal Society of Edinburgh," thinks that it was probably formerly in the University Museum, and adds, "It is not unlikely that the animal had been captured somewhere on the Scottish coast, and that the skull had been presented to the late Prof. Jamieson."

On the continent very few specimens of Sowerby's Whale have been recorded. Prof. Flower, in his paper "On the Ziphioid Whales," in vol. VIII. of the Zoological Society's Transactions, enumerated the following:—A female was taken at Havre in September 1825, and received the name of *Delphinorhynchus micropterus* from Cuvier; its skull is now in the Paris Museum. Another female was stranded at Calvados in the same year; the skull and some of the bones are preserved in the Museum of Caen. The Museum of Brussels contains the com-

plete skeleton of a young female taken at Ostend in 1835; a lower jaw found on the Norwegian coast is in the Museum at Christiana, and Herr Malm informs us that the complete skeleton of a Scandinavian specimen is preserved in the Stockholm Museum. It is a strange coincidence that, as far as is known, all the British specimens have been males and the continental ones females.

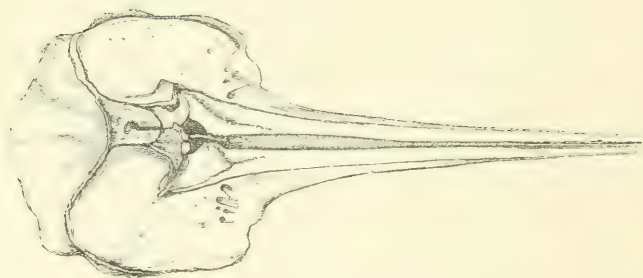
Nothing whatever is known of the habits of Sowerby's Whale. The one which came ashore at Havre is recorded to have uttered cries like the lowing of a cow.

The appearance of the head, as shown in Dr. Busteed's photographs, is very curious. The front slopes gradually into the beak, the blow-hole forming an indentation as seen in profile. The upper jaw is both shorter and narrower than the lower, the projecting teeth being visible externally like the tusks of a Boar, and working in a groove in the thickened and hardened lip of the upper jaw. Under the throat are the two diverging furrows so characteristic of this sub-family. The flippers and dorsal-fin are small. Sowerby's specimen is described as black above, nearly white below, the skin being very smooth and satiny. "Immediately under the cuticle the sides were completely covered with white vermicular streaks in every direction, which at a little distance appeared like irregular cuts with a sharp instrument."

The skull differs so much from that of true *Ziphius*, that it seems necessary to distinguish the species generically. The nares are not placed at the bottom of a deep hollow, but open directly on the top of the skull; the rostrum is long and narrow, and the two compressed teeth of the lower-jaw are placed at some distance from its anterior extremity. The skeleton in the Brussels Museum has thirty-eight vertebrae and ten pairs of ribs.

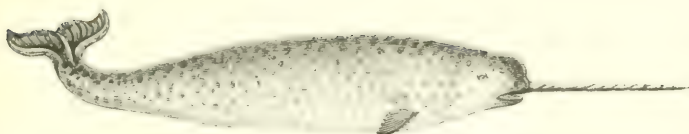
A nearly-allied but probably distinct species, with the teeth much nearer the apex of the jaw, was taken in the Channel in 1840, and is the *Dioplodon europæus* of Gervais. Other species have been recorded from the southern seas, but further information is required as to their characters.

The illustration at the head of this article is a copy of Sowerby's plate, the vignette represents the skull in the Edinburgh Museum, from one of Prof. Turner's figures.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



Genus MONODON (Linnæus, 1765).

Generic Character.—Head round, no beak; no dorsal fin. Teeth in adult $\frac{1}{0}, \frac{1}{0}$, in the female they usually both remain rudimentary and concealed, but in the male the left one is developed into a great tusk, projecting from the snout in the line of the animal's body. Cervical vertebræ usually free.

NARWHAL.

Monodon monoceros (Linnæus).

Specific Character.—Back grey, mottled with black; flanks and belly white, the latter spotted with grey and black. Length of adult 14 to 16 feet, of the exerted tooth, 7 feet or more.

<i>Monodon monoceros</i> ,	LINNÆUS, Syst. Nat., I., 105 (1766).
<i>Narwhalus vulgaris</i> ,	LACÉPÈDE, His. Nat. des Cét., 142 (1801).
„ <i>microcephalus</i> ,	„ „ „ 163.
„ <i>andersonianus</i> ,	„ „ „ 163.

THE Narwhal, perhaps the strangest of the many strange animals included in this order, is essentially an Arctic form, frequenting the icy seas of the highest latitudes, and rarely wandering to more temperate regions. It frequents the coasts of Greenland, Spitzbergen, Nova Zembla, and Siberia, and was seen by Parry as far north as lat. $81^{\circ} 10'$, its favourite haunts principally lying between 70° and 80° . South of this zone it has very rarely been observed. Nilsson records

one occurrence on the coast of northern Norway, and Wagner two on that of north-western Germany.

In Britain the Narwhal has been recorded on three occasions. Tulpius (*Obs. Med.*, p. 376) mentions one taken in June 1648, in the Firth of Forth, near the Isle of May (*prope insulam Mayam*); it was twenty-two feet long, in which measurement the tusk was doubtless included. The second on record came ashore alive in February 1800, near Boston in Lincolnshire; an incorrect drawing of this specimen, sent by Sir Joseph Banks to Lacépède, seems to have been the origin of the *Narwhalus microcephalus* of that writer. A third individual entangled itself among rocks in the Sound of Weesdale, Shetland, in September 1808, and was well described by Dr. Fleming in the first volume of the "Memoirs of the Wernerian Society;" it was a male of twelve feet in length, with a tusk of twenty-seven inches.

The Narwhal is a powerful and active creature, swimming with almost incredible swiftness and consorting in small herds or "schools." Scoresby well describes its manners in the following passage: "A great many Narwhals were often sporting about us, sometimes in bands of fifteen or twenty together; in several of them each animal had a long horn. They were extremely playful, frequently elevating their horns, and crossing them with each other as in fencing. In the sporting of these animals they frequently emitted a very unusual sound resembling the gurgling of water in the throat, which it probably was, as it only occurred when they raised their horns, with the front part of the head and mouth out of the water. Several of them followed the ship, and seemed to be attracted by the principle of curiosity at the sight of so unusual a body. The water being perfectly transparent, they could be seen descend-

ing to the keel and playing about the rudder for a considerable time."

The food of this species consists of various mollusks and fish. Scoresby, having found the remains of large flat-fish in a Narwhal's stomach, thought it probable that the tusk was used in spearing them, as it seemed impossible that an animal with such a small mouth could otherwise capture a large Ray or Skate. But if the tusk is necessary for procuring food, it appears difficult to understand why it is not usually developed in the female as well as the male.

In most cases one young one only is produced, but an instance of a female containing two is recorded in Vol. XV. of the "Linnæan Transactions."

The valuable products of the Narwhal are its oil and ivory. Its blubber, which is usually about three inches in thickness, yields about half a ton of very superior oil, which, as well as the flesh, is considered a great delicacy by the Greenlanders. The tusk is composed of a very dense and beautifully white ivory, which commands a high price in the market—in the middle ages it was still more valuable, being believed to be the horn of the Unicorn of fable, and was fashioned into cups, which were supposed to possess the valuable power of detecting and neutralizing any poison poured into them. The Narwhal is harpooned in the same way as other Whales; when struck, it dives with great velocity, often to a depth of two hundred fathoms, but soon returns to the surface, when it is easily despatched with lances.

"The word Narwhal," says the Rev. Mr. Barclay, "is Gothic, and means literally 'the beaked Whale,' from the Gothic *nar*, Icelandic *ner*, a beak or projecting snout."

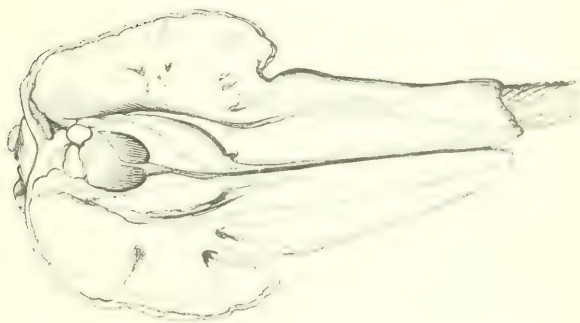
The forehead is rounded, and a slight depression marks the neck. The mouth is small, the jaws pointed, and

the upper one slightly overhangs the lower; the blow-hole is just above the eyes. The anterior part of the body is nearly cylindrical, the remaining portion to the tail conical; in this latter region there are low ridges on the back and belly, and less distinctly marked lateral ridges, giving a sub-quadrangular form to the posterior part of the body. There is no dorsal fin, and the flippers are very small. The upper parts are dusky or blackish grey, varied with marblings and spots of a darker shade, the lower parts are white, marked on the flanks with numerous grey or black spots. The young are bluish grey, and the animal appears to become lighter in colour with age.

The great projecting tusk or "horn" which is so characteristic of the Narwhal, is the left canine tooth, which is developed to this enormous size, while its companion remains abortive; it is produced from the maxillary bone and not from the intermaxillary, as was believed by Cuvier. In the young animal, and usually in the adult female, the rudimentary canines lie parallel to one another in the hollowed-out maxillaries, and consequently when the left tooth is developed it grows straight forward and forms an immense tusk or spear, projecting from the animal's snout in the direct line of the body. This tusk in the adult reaches a length of six or eight feet, or even more, and is covered with spiral markings, twisting from right to left; the point is somewhat blunt and the anterior portion is usually smooth and polished. As already mentioned, the tusk is seldom developed in the female, but several instances are on record in which it has assumed a considerable size.

Occasionally, though but rarely, both tusks are developed. This is well exemplified in a very fine Greenland skeleton, which we had recently the pleasure

of examining in the University Museum at Cambridge, and which has been described and figured by our friend Mr. J. W. Clarke in the Zoological Society's "Proceedings" for 1871. In this specimen the left tusk measures six feet seven inches, and the right, which has been broken, six feet one inch. There is only one other bidental skull in Britain, that of a young animal at Hull, and Mr. Clarke only knows of nine others in the Continental Museums. He also points out that the statement that the *right* tusk is sometimes developed, while the *left* remains abortive, appears to be an error, no such specimen is preserved in any collection, and those who have examined most skulls, as Scoresby and Prof. Reinhardt, never met with such a case.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



GENUS DELPHINAPTERUS (Lacépède, 1804).

Generic Character.—Head rounded, no beak ; no dorsal fin. Teeth in front part of both jaws, sometimes deciduous.

WHITE WHALE, OR BELUGA.

Delphinapterus leucas (Pallas).

Specific Character.—Adult wholly white, young bluish-grey. Teeth $\frac{8}{8}$ to $\frac{10}{10}$. Length of adult 10 to 16 feet.

Delphinus leucas, PALLAS, Reise, III., 92 (1776).

„ *albicans*, FABRICIUS, Fauna Grœnl., 50 (1780).

Delphinapterus beluga, LACÉPÈDE, Hist. Nat. des Cèt., 243 (1804).

Kellelnak of Greenlanders. *Beluga* of Russians.

THE White Whale or Beluga is a native of the Arctic regions, and can only be regarded as an accidental visitor to the coasts of western Europe. It is abundant in Hudson's Bay, Davis Straits, and the Arctic Ocean generally, but Mr. Scoresby never saw it further south than the island of Jan Mayen. It is common about Spitzbergen, and was seen by Steller on the coast of Kamschatka. In the White Sea it is very plentiful, a regular fishery being carried on in the spring and summer at Solza, near the mouths of the River Dvina, and it is said to be sometimes seen off the coast of Norwegian Finmark. It seems to be partial to large rivers; in

America it ascends the St. Lawrence as far as Quebec, and in Asia Schrenk and Nordmann state that it goes far up the River Amur.

On the British coasts the White Whale has appeared occasionally as an accidental straggler. Two young ones are stated to have been cast ashore in the Pentland Firth in August, 1793, some miles west of Thurso, and were observed by Colonel Imrie; they were both males of seven or eight feet in length, and were mottled with brownish-grey. In June, 1815, a male was killed in the Firth of Forth, and is now preserved in the Museum of Arts and Sciences at Edinburgh. It had been seen in the Firth for nearly three months, passing up and down with the tide, and was at last killed by some fishermen with guns and spears; this example was described by Drs. Neil and Barclay in the third volume of the "Transactions of the Wernerian Society." A third occurrence is recorded by Messrs. Baikie and Heddle in their "*Historia Naturalis Orcadensis*," where it is stated that "a dead White Whale was found stranded on the Island of Aukerry after a gale of easterly wind in October, 1845."

The Beluga has long been known under various names, all signifying "White Fish" or "White Whale," *Beluga* being a Russian name derived from the adjective "*beloe*," white. The snowy colour of the animal, sometimes slightly tinged with yellowish or rosy, renders it the most beautiful of the whole order, and its proportions are admirably adapted for the rapid and graceful movements for which it is remarkable. Like most members of the family, it is gregarious, sporting, feeding, and migrating in herds of moderate numbers, and often following vessels and playing round them like the common Dolphin. It must be a beautiful and interesting sight to witness a number of these animals leaping and playing

in the calm dark sea, now pursuing each other in active gambols, now diving after their prey, now re-ascending to the surface to breathe. Prof. Newton, when he saw such a "school" of Belugas near Spitzbergen, in 1864, observed that they glided through the water with an easy roll, now and then showing the whole of their bodies above the waves.

This is almost the only Cetacean which has been kept in captivity for any length of time. A male White Whale, captured in the Gulf of St. Lawrence, was kept alive in a tank in America for two years, and showed great intelligence and docility. On its death it was examined by Prof. Wyman, who gives the following interesting account of its manners in the seventh volume of the "Boston Journal of Natural History":—"I was informed by Mr. Cutting, the proprietor of the Aquarial Gardens, who is a very careful and trustworthy observer, that this animal during his confinement showed some capacity for education. He was sufficiently well trained to allow himself to be harnessed to a car, in which he drew a young lady round the tank; he learned to recognize his keeper, would allow himself to be handled by him, and at the proper time would come and put his head out of the water to receive the harness or take food. At times he showed a playful disposition, and amused himself sometimes with splashing about in the water, and at others with tossing stones with his mouth. He often took in his mouth a Sturgeon and a small Shark which were confined in the same tank, and after playing with them for a while allowed them to go unharmed. Mr. Cutting states that the White Whale was less docile than the *Delphinus tursio*, who was for a time a companion with him in the tank."

The Beluga feeds on various fish, as Cod, Haddocks, &c.;

and also on Cuttle-fish. The female has usually only one young one, which is born in spring, and is at first of a bluish-grey colour, the change to pure white being said not to take place till it is about two-thirds grown.

The skin of the Beluga, although so soft in its natural state as hardly to hold a harpoon, affords a very useful leather, which is at once flexible and tough, and its blubber yields oil of excellent quality. For these products it is hunted in America, Greenland, and Russia, being either harpooned, or, more frequently, surrounded with strong nets and killed with the lance. Its flesh is much valued in Greenland; in the quaint language of Egede, "it has no bad taste, and when it is marinated with vinegar and salt it is as well tasted as any pork whatever; the fins also and the tail, pickled or sauced, are very good eating; so that he is very good cheer."

The head of the White Whale is small, the forehead rounded, the gape narrow, and the upper jaw a little overhangs the lower. The flippers are very short and broad, oval in shape; there is no dorsal fin, and the tail is broad and powerful. The colour of the adult animal is entirely white, sometimes with a yellowish or even a rosy tinge.

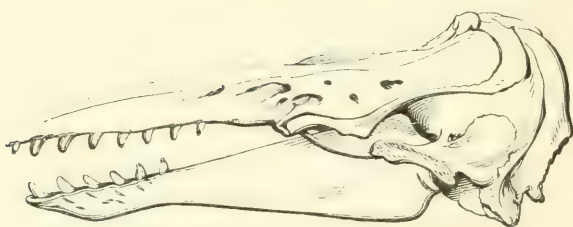
The teeth are conical, often truncated, and vary in number from eight to ten on each side of either jaw. M. Van Beneden considers the most usual number to be nine above and eight below on each side. There are about fifty vertebræ in the spinal column, and the number of pairs of ribs is ten.

The adult animal reaches a length of twelve to sixteen feet, or even more. The dimensions of the Forth specimens as given by Drs. Barclay and Neil are as follows:—

	Ft.	In.
Total length in straight line	13	4
„ following curve of back	14	5
Greatest girth of body	8	11
Length of flipper along anterior margin	2	0
Breadth of „	1	1
„ of tail	3	0½

As the White Whale was the type of Lacépède's genus *Delphinapterus*, it must retain that title, which has generally been misapplied to Péron's Dolphin, the *Delphinus peronii* of Lacépède and *Leucoramphus peronii* of Lilljeborg.

Our figure is a copy of the plate illustrating Drs. Neil and Barclay's paper alluded to above.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



Genus ORCA (J. E. Gray, 1850).

Generic Character.—Head rounded, no distinct beak; flippers oval, broad; dorsal fin high. Teeth large, conical, slightly curved, and permanent.

KILLER, OR GRAMPUS.

Orca gladiator (Lacépède).

Specific Character.—Black above, white below, the colours being sharply defined; a white spot above each eye. Teeth $\frac{11}{11}$ or $\frac{12}{12}$; vertebrae 50; ribs 11 or 12 pairs.

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| <i>Delphinus orca</i> , | LINNEUS, Syst. Nat. I. 108 (1766). |
| " <i>gladiator</i> , | LACÉPÈDE, Hist. Nat. des Cèt. 302 (1804). |
| <i>Orca gladiator</i> , | J. E. GRAY, Cat. Cet. Brit. Mus. 93 (1850). |

THE application of the classical name *Orca* to this genus is hardly supported by the few and meagre facts recorded by ancient writers of the animal known to them by that name. The description given by Pliny (*Hist. Nat.* I. IX., c. vi.) of the capture of an *Orca* at the port of Ostia in the presence of the Emperor Claudius, in which one of the boats filled and sank in consequence of the commotion produced by the blowing of the animal, would seem to imply that the story referred to a Cachelot, rather than to a Grampus, as both the Cuviers have

remarked. The opinion of the same distinguished naturalists, that the *Aries marinus* of Pliny was identical with the present species, is perhaps a more plausible conjecture, for the white mark which is said to have represented the horns of these Sea-Rams may perhaps answer to the spot above the eye of the Killer. Ælian gives a similar description, but some doubt is thrown on the question by the fact that this species has been very rarely taken in the Mediterranean in modern times.

The Killer is an inhabitant of the North Atlantic and the adjoining seas, extending as far north as Greenland, where it is the *Ardlursoak* of the natives. It is not rare on the western coasts of Scandinavia, has been taken on those of Holland, Belgium and France, and has occurred in the Mediterranean in at least two instances.

On the British coasts the Killer is most frequently met with in the north. It is often seen about the Shetland and Orkney Islands, as mentioned by the Rev. Mr. Barclay and by Messrs. Baikie and Heddle. Dr. Fleming states that in the Firth of Tay "it goes nearly as far up as the salt water reaches, almost every tide at flood during the months of July and August, in pursuit of salmon, of which it devours great quantities;" but we must remark that the name of Grampus is constantly given by fishermen to the *Globicephalus melas*, and the two species have consequently often been confounded. Even in the south of England the Killer has occurred in several instances. Three different individuals were taken in the River Thames towards the end of the last century, and described by John Hunter; and the skeleton of one of them is still preserved in the Museum of the Royal College of Surgeons. In the British Museum there is the skull of a specimen taken on the

coast of Essex, and a skeleton from Weymouth. In November, 1830, a male of twenty-one feet in length was stranded in Lynn Harbour, and was tardily despatched with knives and sharpened oars. The groans of this poor animal are described as having been most horrible; its skull was procured for us by our friend Dr. Laird, and is now in the Museum of the University of Cambridge. In March, 1864, a "school" of ten came up the River Parret, in Somersetshire, and were all secured within five miles of Bridgewater; they were examined by Mr. T. Clark, who recorded the fact in the "Zoologist" for the same year. One was taken at Weston-super-Mare in 1871; its skeleton is now in the Oxford Museum.

The fierceness and voracity of the Killer, in which it surpasses all other known Cetaceans, was naturally enough exaggerated by the sailors and fishermen of the north. According to them they attacked the Right Whale in troops, some of the herd hanging on to the colossal victim's tail and biting it till it roared with pain, when one of them would dart into its huge mouth and tear out the tongue. At other times, according to Crantz, a Killer might be seen bearing off a Seal in its jaws, another beneath each flipper, and a fourth under its dorsal fin! Such tales are sufficiently absurd, but the well-authenticated proofs of this creature's savage rapacity almost stagger belief. John Hunter found the tail of a Porpoise in the stomach of a Grampus, and one examined by Prof. Nilsson contained fragments of four Seals. Prof. Eschricht dissected a specimen of twenty-one feet in length, taken on the coast of Denmark in 1861, and found in its stomach the remains of no less than *thirteen* Porpoises and *fourteen* Seals, more or less digested, while the voracious brute seemed to have

choked on the skin of another Seal which was found entangled in its teeth! Holbüll was an eye-witness of a herd of White Whales being driven by Killers into a bay near Godhaven and literally torn to pieces, and mentions a case in which a large "Keporkak" (*Megaptera longimana*) was destroyed by these savage animals.

The name "Killer" or "Whale-Killer" is commonly applied to this large species by sailors, and seems preferable to that of "Grampus," which has been given to several very distinct species, and has latterly been used as the systematic name of a different genus. "Killer" evidently alludes to the carnivorous habits of the animal; "Grampus" is derived through the Norman *Grapois*, from the French *Grand-poisson*, just as Porpoise is from *Porc-poisson*.

The head is obtusely and evenly rounded, passing gradually into the snout, which is not truncated as in some species, although more blunt than in the Porpoise. The upper jaw is slightly the longest; the eye is small, and is placed at a distance of about five inches above and behind the angle of the gape. The external opening of the ear is about as large as a pea; the blow-hole lunate, concave in front. The dorsal fin is very high, especially in the male, being sometimes more than one-fifth of the whole length of the animal. The flippers are broad and oval, and the tail extremely broad and powerful.

The colour is somewhat variable. The upper parts are of a fine glossy black and the lower of a pure white, the meeting of these lines being sharply defined. Above each eye is a white spot, and in some individuals there is a large pale mark on the side, which in others is joined to the white of the belly. Sometimes there is a "saddle-mark" of a grey colour, and in others a

broad stripe of purple runs along the base of the dorsal-fin.

The teeth are eleven or twelve on each side of either jaw, and are large, conical, and slightly recurved. They are permanently retained, and the front ones are found to be worn down much earlier than the others.

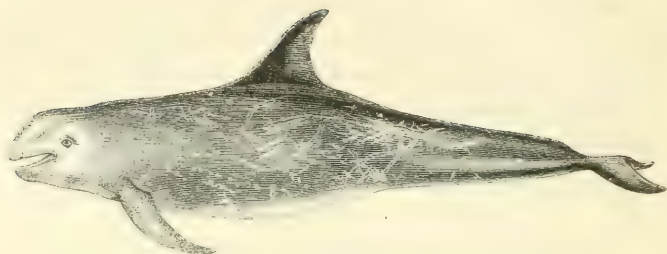
The following are the dimensions of the male taken in Lynn Harbour:—

	Ft.	In.
Total length, along curve of back	21	3
„ in straight line	19	0
Girth of body	14	0
From snout to dorsal-fin	8	2
Height of „	4	0
Length of flipper	4	0
Breadth of „	2	8

Three distinct species of Killer have been distinguished by the Danish naturalists, namely, the present species and two smaller ones, *Orca schlegellii* of Lilljeborg, and *O. eschrichtii* of Steenstrup. The specific distinction of these forms seems to require further confirmation, and as they have not yet been met with in British waters, we may refer such of our readers as may wish for further particulars on the subject to the translation of “Recent Memoirs on the Cetacea,” published by the Ray Society. Two other species are described by Dr. Gray in his “Supplement to the Catalogue of Seals and Whales in the British Museum” (1871) from British skulls, these are *O. stenorhyncha*, in which the rostrum of the skull is more attenuated than in *O. gladiator*, and *O. latirostris*, in which it is comparatively broader. As nothing further is yet known of these animals, they may be allowed to wait for further confirmation of their specific distinctness.

CETACEA.
(ODONTOCETI).

DELPHINIDÆ.



Genus GRAMPUS (Gray, 1846).

Generic Character :—Head rounded, no beak ; flippers long and narrow, placed low down ; dorsal-fin high. No teeth in upper jaw at any age, those of lower jaw few, and confined to the front part of the mandible.

RISSO'S GRAMPUS.

Grampus griseus (G. Cuvier).

Specific Character :—Colour variable, from black above and white below to a pale grey passing to black towards the tail, marked all over with stripes and streaks irregularly disposed in every direction. Teeth $\frac{0}{33}$ to $\frac{0}{77}$; vertebræ 68 ; ribs 12 pairs.

<i>Delphinus griseus</i> ,	CUVIER, Ann. du Mus., XIX., 14 (1812).
<i>rissoanus</i> ,	DESMAREST, Mamm., 519 (1822).
<i>Grampus cuvieri</i> ,	J. E. GRAY, Ann. Nat. Hist. (1846).
„ <i>griseus</i> ,	FLOWER, Trans. Zool. Soc., VIII. 1.

THIS species was first described by Cuvier from a drawing and the skeleton of a specimen taken at Brest. The latter is still preserved at Paris in the Museum of the Jardin des Plantes. Since that time other individuals have occurred on the French coast. In 1822 another species was established by Desmarest on a figure and description forwarded to the Academy by M. Risso of Nice, and received the name of *Delphinus rissoanus*. That the two species were very closely allied was evident, and

Cuvier himself thought that they might prove to be identical. More recently M. Fischer has arrived at the conclusion that they both belong to one very variable species (*Ann. Sc. Nat.* 1868, p. 363), a view which has been fully confirmed by Prof. Flower in the "Transactions of the Zoological Society" for 1871, and by Dr. Murie (*Journ. Ann. Phys.* v. V.). Cuvier's specific name was changed by Dr. Gray in the "Annals of Natural History" for 1846 into *cuvieri*, on the ground that the colour of the animal was black, and not grey, but as will be seen, this character is one liable to the greatest variation.

On the English coast Risso's Grampus has hitherto only been found in the Channel. One ran aground near Puckaster in the Isle of Wight in the spring of 1843, and its skull was presented to the British Museum by the Rev. C. Bury, who described the specimen in the "Zoologist" for 1845. An adult female, ten feet six inches long, was taken in a mackerel-net near Eddystone Lighthouse on the 28th Feb. 1870, and was brought to London; it is now in the British Museum, and is figured and described in Prof. Flower's memoir. About a month later a young female, about six feet long, was sold in the fish-market at Billingsgate, and was described both by Mr. Flower and Dr. Murie; the exact place where it was taken could not be ascertained, but it was probably also from the Channel.

Nothing can be said to be known of the habits of this rare cetacean, which seems only to have fallen into the hands of naturalists on eleven occasions, eight times on the French and thrice on the English coasts. Four were stranded together in La Vendée in June, 1822, and large herds were taken in the Mediterranean in 1829 and 1854. D'Orbigny notices that the Vendéen animals

uttered loud cries when they came ashore, so as to alarm the whole neighbourhood. One preserved in the Town Museum at Nice is labelled as having been taken there in June, 1855.

In general form Risso's Grampus, according to Prof. Flower, closely resembles the Pilot-Whale (*Globicephalus melas*). The forehead is rounded, with no proper beak; but the thick projecting upper-lip is separated by a hollow from the convexity of the head. The flippers are long and narrow, and the dorsal-fin high and falcate. As already mentioned the colour is extremely variable in this species, being either black above and white below, or clear grey, passing into black on the posterior parts, and into white on the belly. But the most remarkable character of the colouration is the manner in which these ground-tints are marked by irregular lines and streaks, running in all directions without any definite pattern; when best developed, each of these lines has a narrow white centre and a black border. In the younger British specimen noted above, the flanks were marked with white stripes, vertically disposed and nearly symmetrical.

The teeth are confined to the *lower* jaw, even in extreme youth, and vary from three to seven on each side, placed in the front part of the mandible. The number of vertebræ is sixty-eight and of ribs twelve pairs.

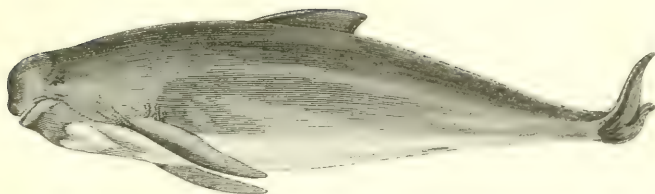
Our illustration represents this example as figured in the plate published with Mr. Flower's paper.

The following are some of the measurements of the adult female specimen described by Prof. Flower:—

	Ft.	In.
Total length in straight line	10	6
From upper lip to dorsal-fin	3	11
" " flipper	1	9
Height of dorsal-fin	1	4
Length of flipper	1	11 $\frac{3}{4}$
Breadth of tail	2	5

CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



Genus GLOBICEPHALUS (Lesson, 1842).

Generic Character :—Head rounded ; no beak. Dorsal-fin long ; flippers very long and narrow, the second digit having 14 phalanges. Teeth large, conical, many of them soon lost.

PILOT-WHALE.

Globicephalus melas (Trail).

Specific Character :—Black, a whitish stripe along the belly, forming in front a heart-shaped spot under the throat. Teeth sometimes $\frac{3\frac{1}{2}}{3\frac{1}{2}}$, generally fewer ; vertebræ 56, and ribs 12 pairs. Length of adult 16 to 20 feet.

Delphinus melas, TRAIL, Nichols. Journ., XXII., 81 (1809).

„ *globiceps*, CUVIER, Ann. du Mus., XIX., 1, pl. I. (1812).

„ *deductor*, SCORESBY, Arct. Regions, I., 496.

Ca'ing Whale of Orcadians. *Grinderval* of Faroese. *Bottle-head*, *Bottle-nose*, and *Grampus* of English fishermen.

Our knowledge of the habits of many of the cetaceous animals is so meagre, and our opportunities of observing them are so rare and imperfect, that it is often difficult to seize upon any facts of interest and importance to enliven the dry detail of formal description. Such, however, is not the case with the present remarkable species. From the sociability of its habits, its strong instinct of attachment, and a tendency to imita-

tion which not only influences it in pursuit of its prey, but often hurries whole troops into the power of its most destructive enemy, it becomes an object of interest not only to the fisherman, but to the naturalist and the investigator of psychological science.

The Pilot-Whale is a native of the northern seas, and according to Eschricht migrates from the Polar Seas to the Atlantic. Large shoals constantly appear in the neighbourhood of Iceland and the Faroe Islands, and not unfrequently on the more southern coasts of Europe. It also appears to enter the Mediterranean, and either this or a nearly-allied species is the "Blackfish" of the American coasts.

It visits the shores of Britain in large herds, but at irregular intervals of time. Hardly a year elapses without its appearance at Shetland, where it is called the *Ca'ing* or driving Whale; it is often taken in Orkney, and more rarely among the Hebrides. Further south it is not so often seen, but it has been recorded from many points of our coast, even to the Channel and Cornwall.

This is, perhaps, the most gregarious of all the cetaceans. Herds of two or three hundred are of not unfrequent occurrence, and they sometimes assemble to the astonishing number of one or two thousand. This extraordinary tendency to association, and their habit of blindly following one another like a flock of sheep, frequently leads to the capture of immense numbers, for no sooner is one individual driven ashore than the rest of the herd follow with blind impetuosity, and, throwing themselves into shallow water, become an easy prey to their pursuers. They are thus an important object of pursuit to the inhabitant of Iceland, Faroe, Shetland, and Orkney, yielding an abundant supply of good oil.

On the appearance, therefore, of a shoal of these

Whales, the whole fishing squadron of the neighbourhood is put into requisition, each boat being provided with a quantity of stones. The first object is to get to seaward of the victims, then the boats are formed into a large semicircle, and the whole herd is driven into some bay or creek. The stones are thrown to splash and frighten the Whales if they try to break back, and in Faroe, ropes are stretched from boat to boat with wisps of straw hung at intervals. Should one Whale break through the line all is lost, the rest will follow it in spite of every exertion of the fishermen. But if they are forced into shallow water, they plunge wildly on till they strand themselves, and then the whole population rush upon them, armed with harpoons, spears, hatchets, picks, spades,—any weapon that comes to hand, and the cries and dying struggles of the poor animals, the shouts of the men, the clash of weapons, and the bloody and troubled sea, combine to form an extremely exciting if somewhat revolting scene.

In this manner, very large numbers are often secured. Provost Debes, in his "Description of Færoe" (English Ed., London, 1676), says that "it happened in the year 1664 there were taken in two places about a thousand. Wherefore," adds the good old Provost, "the Lord, as also for his other benefits, be blessed and praised." In the winter of 1809-10 no less than eleven hundred and ten are said to have been captured at Hvalfjord in Iceland. In the "Zoologist" for 1846 it is stated, on newspaper authority, that two thousand and eighty were taken in Faroe in the previous year within six weeks, and that fifteen hundred and forty were killed *within two hours* in Quendall Bay, Shetland, on the 22nd Sept., 1845, not one escaping.

Like the other *Delphinidae*, the Pilot-Whale feeds on

fish. The Rev. Mr. Barclay states that it eats cod and ling, but its favourite food seems to be the cuttle-fish, of which great quantities are usually found in its stomach.

The female has generally only one young one, which is more than three feet long at birth. It appears to be born late in summer, and to be suckled throughout the winter.

The names "Pilot-Whale," "Ca'ing" or *Driving* Whale, and Scoresby's specific name of *deductor*, all allude to the habit of the animal already dilated on, of following a leader either for good or evil. Fishermen and sailors usually term it the "Bottle-nose," but that term is applied by them to many very distinct animals.

The forehead is bluff and rounded, the jaws short, the upper being slightly the longest, the upper lip thick and fleshy. The blow-hole is crescentic, concave in front, the eyes very small, and placed near the angle of the gape. The body is thickest just in front of the dorsal-fin; towards the tail it is much compressed with a sharp dorsal and ventral outline. The flippers are very long, narrow and sabre-shaped, broadest near the base, but narrowed at the wrist. The dorsal-fin is long and sloping, the tail lunate, deeply cleft, and tapered at the points.

The colour is rich deep black all over, excepting a white heart-shaped mark under the throat, extending in a broad whitish stripe along the breast and belly.

The teeth are conical, slightly curved, and less than an inch in length; they vary much in number, but the normal dentition would appear to be $\frac{0 \cdot 2 \cdot 2 \cdot 0}{2 \cdot 4 \cdot 2 \cdot 4}$ to $\frac{2 \cdot 4 \cdot 0 \cdot 4}{2 \cdot 4 \cdot 2 \cdot 4}$; in old individuals many of them are lost.

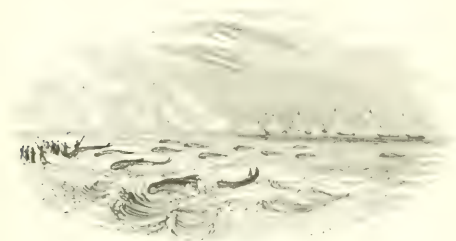
The skeleton has usually fifty-five or fifty-six vertebræ, the cervicals being generally separate, except the second and third; there are twelve pairs of ribs. Dr. Murie has

given a full account of the anatomy of this species in the "Transactions of the Zoological Society" (v. VIII. p. 235).

The Pilot-Whale attains a length of sixteen to twenty feet, or even, it is said, of twenty-four feet. The following are some of the dimensions of a female killed in the Firth of Forth in April 1867, which we had the pleasure of personally examining :—

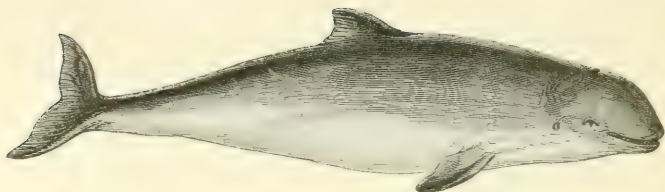
	Ft.	In.
Total length	15	2
From nose to eye	1	7
" " angle of gape	1	2½
" " dorsal-fin	4	7
Length of flipper, along anterior edge	4	2
Greatest breadth of ditto	0	11
Breadth of tail-fin	1	4

In 1861, Dr. Gray described a skull received from Bridport as specifically distinct, under the name of *G. incrassatus*, and he has subsequently made it the type of his genus *Sphærocephalus* (P. Z. S., 1861, p. 211). This skull, which is now in the British Museum, is, however, so much water-worn that it seems unsafe to consider it distinct until other similar specimens have been procured.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



Genus PHOCÆNA (Cuvier, 1827).

Generic Character.—Head rounded, with no distinct beak; a dorsal-fin. Teeth compressed, spatulate, truncated. Rostrum of skull broad, depressed.

PORPOISE.

Phocæna communis (F. Cuv.).

Specific Character.—Black, lighter beneath, almost white on the belly. Teeth $\frac{20.20}{21.20}$ to $\frac{26.26}{26.26}$. Anterior edge of dorsal-fin with a row of small tubercles. Length of adult 4 to 5 feet.

Delphinus phocæna, LINNÆUS, Syst. Nat., I., 108 (1766).

Phocæna communis, F. CUVIER, Hist. Nat. des Cèt., 172 (1838).

„ *tuberculifera*, J. E. GRAY, P. Z. S., 1865, p. 320.

Nisa of Greenlanders, *Tumlare* of Swedes. Local names, Nisack (Shetland), Pelloch (Scotland), Sniffler (Cornwall), Herring-Hog, Hog-fish.

THE Porpoise is the most common of the cetaceans of our seas, and is gregarious, making its appearance in herds of various numbers, playing and tumbling in the water with an agility which rivals that of the Dolphin. Every one who has resided by the sea-side is familiar with the rude unwieldy gambols in which these creatures indulge, now pursuing each other in sport, now diving with great force and vivacity after their prey. On the

approach of a storm, or even in the midst of the tempest, they appear to revel among the waves, showing their black backs above the surface, and often throwing themselves wholly out of the water in their vigorous leaps.

The Porpoise is an inhabitant of the North Atlantic, usually found near the shore, and hardly ever met with far from land. It is migratory in its habits to some extent. In Greenland, according to Fabricius, it is rarely seen in winter, and the same is observed in Orkney by Messrs. Baikie and Heddle. Eschricht observes that it enters the Baltic in spring through the Sound, in pursuit of the Herrings, and leaves in autumn by the Little Belt. On the coast of Finmark, however, it is stated by Herr Malmgren to be present at all seasons.

The food of the Porpoise consists mainly of fish, and it may constantly be observed in pursuit of such species as go in large shoals, as Mackerel, Pilchards, and Herrings; we have known over two dozen freshly-swallowed fish of the last-named species to be found in the stomach of a small Porpoise. It is also very destructive amongst Salmon when they are entering the mouths of rivers, and is not uncommonly taken in the nets that have been set for its victims.

Porpoises often ascend rivers in pursuit of fish, and they were formerly not uncommonly seen high up the Thames, even above London Bridge. We were informed by our friend Dr. Thomas Bell Salter, of Poole, that many years ago three which wandered up the Wareham river were made prisoners, fences being put across the river above and below them, but they plunged so violently, and their cries, which were continued by night as well as by day, were so distressing, that they were put out of pain on the third day of their captivity: one of them

was found to be a pregnant female. Of late years more than one attempt has been made to keep Porpoises alive in the gardens of the Zoological Society, but hitherto without success, the animals having experienced rough treatment before coming into the Society's hands. That the animal will live in confinement under favourable circumstances is shown by the fact, recorded by Mr. Couch, that one taken by some fishermen in Cornwall was placed in a pond at a farm, where it lived for a month.

The period of gestation is stated by Anderson to be six months, and the pairing season is said to be in summer. This agrees with the account given above on Dr. Salter's authority, in which a female was found to be pregnant towards the end of the year: but Mr. Jenyns relates that one brought to the London market in May 1833, was found to contain a full-formed young one.

The name Porpoise is derived from the French *Porc-poisson*, and names similar in significance have been given it in many languages; as the French *Marsouin*, Gothic *Marsuin*, German *Meerschwein*, and English Sea-hog, Herring-hog, and Hog-fish. The Shetland name of *Neesook* or *Nisack* is a diminutive of the Norse name *Nise*, the primary meaning of which, we are informed by the Rev. T. Barclay, is a goblin or sprite.

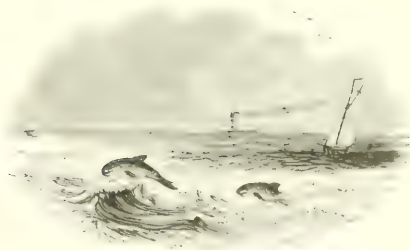
The head of the Porpoise is rounded, the forehead is obtuse, and there is no external beak or rostrum; the opening of the mouth is moderately large, and the lower jaw is very little longer than the upper. The eye is small, with a vertical elliptical pupil; the blow-hole is exactly over the eyes, and is in the form of a crescent, concave in front. The dorsal-fin is obtusely triangular, the anterior margin slightly convex and often furnished with a series of small tubercles—these, although noticed

by Camper and by Dr. Jackson of Boston, have been generally overlooked, and consequently Dr. Gray, on first observing them, regarded them as the characters of a new species, which he named *Ph. tuberculifera*.

The colour of the upper parts is dusky or black, becoming gradually lighter on the sides and nearly passing into white on the belly; the flippers are tinged with brown.

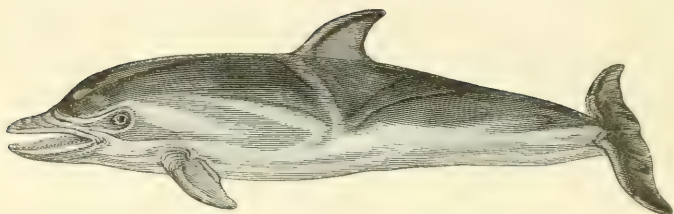
The teeth vary in number from twenty to twenty-six on each side of either jaw, and differ in form from those of most of the *Delphinidae*; instead of being conical, they are enlarged, compressed and truncated at the apex, with a contracted neck below. The rostrum of the skull is broad, the cervical vertebræ are usually anchylosed; the whole number of vertebræ is sixty-five and of ribs thirteen pairs.

The Porpoise attains a length of from four to five feet.



CETACEA.
(GDONTOCETI.)

DELPHINIDÆ.



Genus DELPHINUS (Linnæus, 1766).

Generic Character.—Head with well-marked produced beak ; a dorsal-fin. Teeth conical, equal, and numerous in both jaws. Beak of skull usually as long as brain-case, or even longer.

COMMON DOLPHIN.

Delphinus delphis (Linn.).

Specific Character.—Black above, shaded to brilliant white below. Teeth $\frac{40}{38}:\frac{40}{38}$ to $\frac{50}{50}:\frac{50}{50}$; vertebræ 70 to 75. Length of adult 6 to 8 feet.

<i>Delphinus delphis,</i>	LINNÆUS, Syst. Nat., I., 108 (1766).
„ <i>vulgaris,</i>	LACÉPÈDE, Hist. Nat. des Cèt., 250 (1804).
<i>Δελφίς,</i>	ARISTOTLE, Hist. An. Z., VI., c. 12.
<i>Delphinus,</i>	PLINY, Hist. Nat. Z., IX., c. 8.
<i>Ardhuarsuk</i> of Greenlanders, <i>Springare</i> of Swedes.	

THE mythological and poetical associations which belong to the Dolphin, its reputed attachment to mankind, its benevolent aid in cases of shipwreck, its dedication to the gods, and many other attributes expressive of the high estimation in which it was held in olden times, afford a striking example of how the unrestrained imagination of the ancients could raise the most gorgeous structures of poetry and religion upon the most slender basis. The story of Arion's escape on the

back of a Dolphin which he had charmed by his music is universally known, and the ear of Amphitrite drawn across the ocean by a group of the same animals is a fiction as easy and natural as it is beautiful. Nor are the ancient representations of its form much more consonant with truth than these stories of its habits, and it requires some stretch of the imagination to identify the round-headed creature, with curved back and spiny fins which is represented in ancient coins and statues, with the straight sharp-beaked animal figured at the head of this description. There are exceptions, however, to this general censure, and there is no difficulty in recognizing the Common Dolphin in the animal represented on the reverse of a Syracusan coin of uncertain date preserved in the British Museum, of which the vignette is an accurate copy.

The Common Dolphin is a native of the more temperate regions of the North Atlantic, and of the Mediterranean Sea. It is known on the Greenland coast, but is there rarer than the Porpoise. Lilljeborg considers it rare in the Scandinavian Seas, but Herr Malmgren identifies a large "school" seen by him on the Norwegian coast with this species. South of these countries it is not uncommonly met with on both sides of the Atlantic, and according to M. Gervais it is stationary in the Mediterranean.

In our own waters this Dolphin is not uncommon, and is frequently taken in fishermen's nets. On the Cornish coasts Mr. Couch says that it appears in considerable numbers. "In the month of September 1845, eight or ten in a day were brought on shore at Mount's Bay for many days in succession." Dolphins are sometimes to be seen in the fish-market at Billingsgate, and three specimens from that source are preserved in the British

Museum. It appears to be much rarer on the shores of the more northern parts of Britain than in the south.

The habits of the Common Dolphin appear to be similar to those of the rest of this extensive genus. The excessive activity and playfulness of its gambols, and the evident predilection which it evinces for society, are recorded by every mariner. Large herds of these animals will surround a ship in full sail with the most eager delight, throwing themselves into every possible attitude and tossing and leaping about with elegant and powerful agility, for no apparent purpose save mere pastime.

The principal food of the Dolphin is fish of various kinds, along with invertebrate animals, as Cuttle-fish, crustaceans, and *Medusæ*. On the Cornish coast it seems to prey chiefly on Pilchards and Mackerel. Its voice is said to consist only of a low murmur or suppressed lowing sound.

The female brings forth but a single young one, which she nurses and suckles with the greatest tenderness and care. As in the other cetaceans, the mammary glands become much enlarged at the period of birth, and the teats are exerted; the calf seizes the teat with its lips, and the mother floats to some degree on one side, so as to enable both herself and her young one to breathe while the operation of suckling is going on. The milk is abundant and very rich.

The flesh of this animal was formerly considered a delicacy, and it was eaten, as was the Porpoise, with a sauce composed of crumbs of bread, vinegar and sugar. As all cetaceans were considered to be fishes, the Church permitted their flesh to be eaten on maigre days. M. F. Cuvier says that this custom of eating the Dolphin

was general in France, and the authority of Dr. Caius shows that it was considered a delicacy in England, but it is probable that it never was caught in sufficient abundance on our shores to be a common article of food in this country.

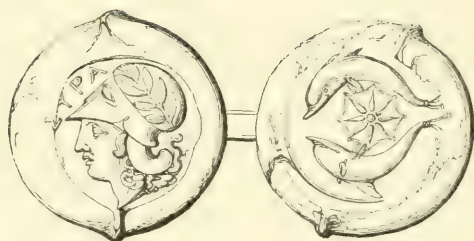
The name Dolphin is from the French *Dauphin*, which is derived from the Latin *Delphinus*, Greek *Delphis*. Dr. Gray remarks of this genus that "most maritime persons call these animals '*Bottle-noses*, *Bottle-heads*, or *Flounder-heads*,' sometimes adding whale to the name. They generally confine the name of Dolphin, most used by landmen, to the Scomberoid fish (*Coryphæna*) which changes colour in dying." It is to the fish, therefore, and not to the cetacean, that the time-honoured poetical allusions to "the dying Dolphin's changing hues" are to be referred.

The Common Dolphin has the forehead abruptly rounded and descending rather suddenly to the base of the rostrum, which is somewhat depressed, whence the French names of "*Bec d'Oie*" and "*Oie de Mer*" applied to this animal; it is about six inches in length, and is separated from the forehead by a slight ridge. The jaws are long and powerful and are covered by thin and almost immovable lips. The blow-hole is crescentic, with the horns directed backwards; the eye is of moderate size, and the orifice of the ear extremely small, being scarcely larger than a pin-hole. The body tapers towards the tail, its greatest thickness being just in front of the dorsal-fin, which is about nine inches in height, the anterior margin being convex and the posterior somewhat concave. The upper parts are black, shading through the grey of the flanks to a clear glittering white beneath.

The teeth vary in number, but there are usually from

forty to fifty on each side of either jaw ; they are acute, slightly curved, and those of the upper jaw lock in the most even and perfect manner with those of the lower.

The adult animal attains a length of from six to eight feet.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



BOTTLE-NOSED DOLPHIN.

Delphinus tursio (Fabricius).

Specific Character.—Back black, sides dusky, belly dirty white. Beak short but distinct. Teeth $\frac{20}{20}$ to $\frac{22}{22}$, truncated in age. Rostrum of skull with two ribs above, formed by the convexity of the intermaxillaries; vertebrae 41; ribs 13 pairs. Length of adult 8 to 12 feet.

<i>Delphinus tursio</i> ,	FABRICIUS, Fauna Grœn., 49 (1790).
„ <i>truncatus</i> ,	MONTAGU, Mem. Wern. Soc., III., 75 (1821).
<i>Tursio truncatus</i> ,	J. E. GRAY, List Mam. Brit. Mus., 104 (1850).
<i>Tursiops tursio</i> ,	GERVAIS, Hist. Nat. des Mam., 323 (1855).

THE Bottle-nosed Dolphin is a much rarer animal than the last described, but appears to have a very similar geographical distribution, extending throughout the temperate regions of the Atlantic from Greenland to the Mediterranean. It seems to occur, though rarely, on the coasts of all the countries of Western Europe.

In British waters the first recorded occurrence seems to have been that of a female of eleven feet in length, accompanied by a sucker, which were taken near Berkeley, and described by John Hunter in the “Philosophical Transactions” for 1787, under the name of “Bottle-nosed Whale.” Another, which was killed in the River Dart in Devonshire in 1814, was described by Col. Montagu as a new species, *Delphinus truncatus*, in the third volume of the “Memoirs of the Wernerian Society” —its skull is still preserved in the British Museum. Since

that date it has occurred in several instances and at different parts of our coast, in Scotland and Ireland, as well as in England. One taken near Preston is mentioned by Mr. Jenyns; a specimen caught on the south coast of Ireland in 1829 is figured by Dr. Gray in the "Zoology of the Erebus and Terror." In the same year one was taken in the Thames below the Nore; its skeleton is in the Museum of the Royal College of Surgeons. The skeletons of two, taken in the Firth of Forth, are preserved at Edinburgh, one of which, in the Surgeons' Hall, has the teeth acute. A large shoal was taken near Holyhead in 1866, the skeletons and skulls of some of which are preserved in Museums at Oxford and Cambridge.

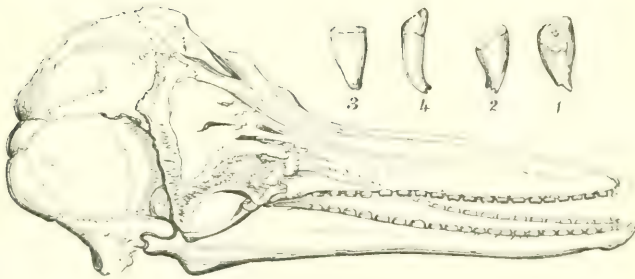
Little has been recorded of its habits. It appears occasionally to enter rivers. Montagu's specimen was taken five miles from the mouth of the River Dart, and showed great tenacity of life, having suffered the attacks of eight men armed with spears and guns, and assisted by dogs, for four hours before it expired: when wounded it made a noise like the bellowing of a bull. The one taken in the Thames in 1828 also, is recorded by Mr. Howslip to have "survived many hours after it was dragged out of the water, during which time it emitted a sound not unlike the bellowing of a calf."

The forehead is rounded, the beak distinctly marked, but shorter than in the Common Dolphin, and the lower jaw slightly the longest. The flipper is about the length of the dorsal-fin, both being shorter than in the last species. The upper parts are purplish-black, the sides dusky, paling to a dirty white on the belly. The colour is perhaps variable, for Prof. Schlegel has figured one of a uniform black all over (*Dieren, t. 12*).

The number of teeth varies from twenty to twenty-five in each side of either jaw; in the adult animal they are

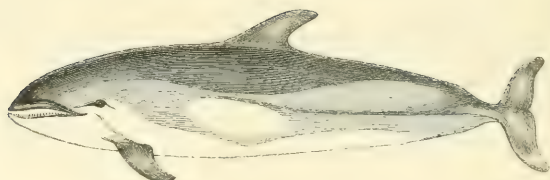
truncated, but in the young conical and pointed. The skeleton has forty-one vertebræ and thirteen pairs of ribs; in the skull the intermaxillaries are convex above, so as to form two well-marked ribs on the upper part of the rostrum.

The adult animal attains a length of from eight to twelve feet.



CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



WHITE-SIDED DOLPHIN.

Delphinus acutus (J. E. Gray).

Specific Character.—Black above, white below, on each flank is a large white stripe, which is continued above and behind by a yellow or brownish band. Rostrum of skull slender and pointed; teeth $\frac{28}{28}:\frac{28}{28}$ to $\frac{36}{36}:\frac{36}{36}$ vertebrae 80 or 82, ribs 15 pairs. Length of adult 6 to 8 feet.

<i>Delphinus acutus</i> ,	J. E. GRAY, Spic. Zool., 2 (1828).
„ <i>eschrichtii</i> ,	SCHLEGEL, Abhandl. Zool., &c., p. 23 (1841).
„ <i>leucopleurus</i> ,	RASCH, “Nova Spec. Descript.,” &c., (1843).
<i>Lagenorhynchus</i> „	GRAY, Zool. Erebus and Terror, I., 34 (1846).
„ <i>acutus</i> ,	„ „ „ „ „ I., 36 „

WE have followed the example of Nilsson, Eschricht, and Lilljeborg, in considering the *Delphinus leucopleurus* of Rasch to be identical with Dr. Gray's *D. acutus*; and also with Schlegel's *D. eschrichtii*. They appear to agree in all important points, both of external appearance and of osteological structure. Dr. Gray first described *D. acutus* from an Orkney skull, formerly in the collection of Mr. Brookes and now in the Museum of Leyden; while the types of Herr Rasch's species were a large shoal which occurred in the Christiania Fjord in 1843.

Besides the Orkney example mentioned above, an adult female was sent from the same locality in May

1835 to the late Dr. Knox of Edinburgh, who described it under the name of *D. tursio*; but its skeleton, which is still preserved in the Museum of Science and Art at Edinburgh, proves it to belong to this species. In August 1858, a small shoal of about twenty Dolphins were captured in Scalpa Bay, near Kirkwall, and a description and plate were given by Dr. A. R. Duguid in the "Annals and Magazine of Natural History" for 1864. According to that gentleman this species is often seen about the Orkneys by the fishermen, but is rarely secured.

The colour of the White-sided Dolphin is a deep black above, and a pure white on the throat and belly. On each flank is a short broad stripe of pure white, above and behind which is a band of yellow or brownish-grey, either confluent with the white mark or narrowly separated from it. These markings appear to be very regular and give the animal a most attractive appearance.

The rostrum of the skull is slender and tapered. The teeth are small and seem to vary from twenty-eight to thirty-eight in each side of either jaw. In one of Dr. Duguid's specimens the formula was $\frac{29 \cdot 29}{3 \cdot 3 \cdot 3}$. The skeleton has about eighty vertebræ and fifteen pairs of ribs.

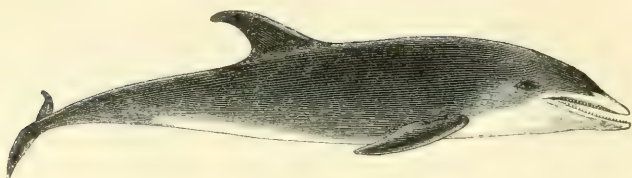
The adult attains a length of six to eight feet. The following are some of the measurements of a male (Dr. Duguid) and of a female (Dr. Knox):—

	Male.		Female.	
	Ft.	In.	Ft.	In.
Total length (following curve)	8	3	6	5½
Greatest girth	4	3½	3	2½
Length of flipper	1	4½	0	10
Breadth of tail	2	1	1	2

Our figure is from Dr. Duguid's plate in the "Annals and Magazine of Natural History" for 1864.

CETACEA.
(ODONTOCETI.)

DELPHINIDÆ.



WHITE-BEAKED DOLPHIN.

Delphinus albirostris (J. E. Gray).

Specific Character.—Deep purple-black above, beak, lips and belly creamy white; the colours sharply defined. Teeth $\frac{23}{21}$ to $\frac{25}{23}$, small, curved. Vertebrae 88 to 90, ribs 15 pairs. Length of adult 7 to 9 feet.

Delphinus albirostris, J. E. GRAY, Ann. and Mag. Nat. Hist., XVII. (1846).
Lagenorhynchus albirostris, „ Zool. Ereb. and Terr., I., 35. „

SEVERAL examples of the White-beaked Dolphin have been taken on the British coasts. One was killed at Hartlepool in 1834, although the species was not recognized at the time; its skull, formerly in the Durham Museum, is now in that of the University of Cambridge. The same fine collection also contains the skeleton of a young male taken on the English coast in 1867. One was captured by some herring-fishers in 1846 off Yarmouth, and was described and figured under the name of *D. tursio* by Mr. Brightwell in Vol. XVII. of the “Annals and Magazine of Natural History;” another figure from the same original drawing is given by Dr. Gray in “The

Zoology of H. M. S. Erebus and Terror," pl. 10. Both the skin and skeleton of this specimen are now in the British Museum, which also contains the skull of one killed near Cromer by Mr. H. M. Upcher of Sherringham Hall (*Ann. and Mag. Nat. Hist.* 1866), and the complete skeleton of an adult male taken a few years ago on the south coast, but in what precise locality we have been unable to learn; an account of the anatomy of this last example is given by Dr. Murie in the "Proceedings of the Linnæan Society" for 1871.

This species is a native of the North Atlantic, but does not seem to be common. It has been taken at Færoe, and on the coasts of Norway, Sweden, Denmark, and Belgium. Nothing seems to have been recorded of its habits.

The White-nosed Dolphin is a handsome species. The following is Mr. Brightwell's description of the Yarmouth specimen:—"The colour of the upper part and sides was a very rich deep purple-black. The external cuticle was of a soft and silky texture, and so thin and delicate that it was easily rubbed off. The nose and a well-defined line along the upper jaw, and the whole of the lower jaw and belly were of a cream colour, varied in some parts by a chalky white, which contrasted beautifully with the rich black of the body. The fins and tail were of the same colour as the back."

The teeth are small and are twenty-three to twenty-six in number, in each side of either jaw. The vertebræ are eighty-eight to ninety, and there are fifteen pairs of ribs. The rostrum of the skull is as long as the brain-case and is regularly tapered to the snout.

The adult animal attains a length of eight or nine feet. The following measurements are some of those recorded by Mr. Brightwell:—

	Ft.	In.
Entire length	8	2
Greatest girth	4	10
Snout to flipper	1	8
Length of „	1	3
Height of dorsal-fin	0	10
Breadth of tail	1	10

A fifth species of Dolphin, *Delphinus euphrosyne*, has been added to the British list by Dr. Gray (*Cat. Seals and Whales*, p. 251), a skull in the Norwich Museum being believed to have belonged to a British-killed animal. Our friend Mr. Southwell has kindly made further inquiries as to the history of this specimen, but has been unable to learn anything authentic. The claim of the species to a place in our Fauna may therefore wait for further confirmation.



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